The Summer Consumer Electronics Show

COMPUTE!'s GAZETTE

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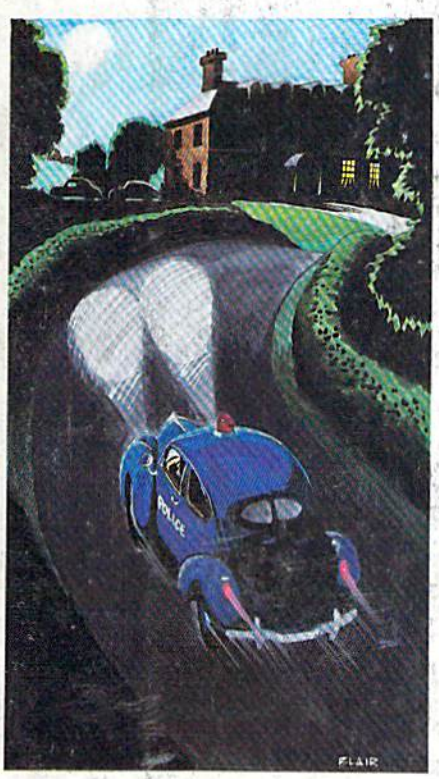
For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers



80 Columns For The 64

Screen 80: Convert your 64 into an 80-column machine.
Custom 80: Customize your own 80-column character set.

SpeedScript Customizer

Tailor your SpeedScript screen and printer output with this short, easy-to-use program for the VIC and 64.

Also In This Issue:

Computing For Families

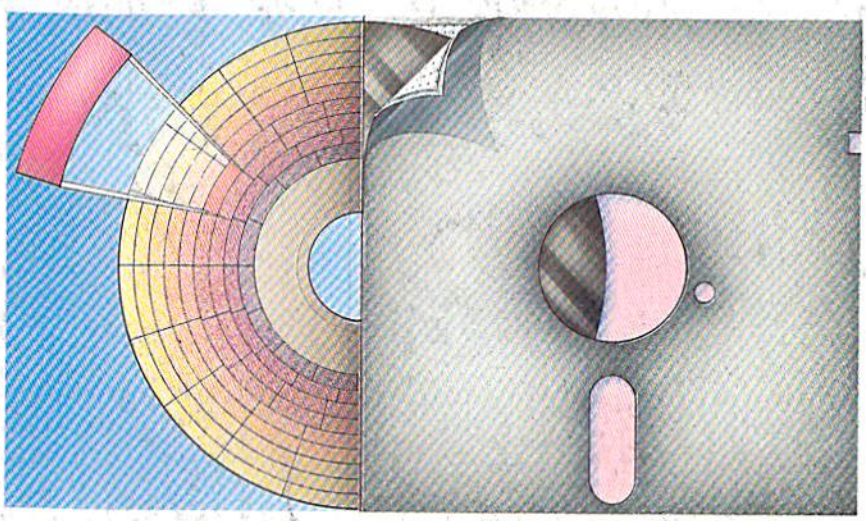
Learning To Count For VIC And 64

Home Telecommunications: The Electronic Cafe

Animating The VIC

Mystery At Marple Manor

Was it the cook? The duchess? Was it done with a knife? Or was it poison? A whodunit text adventure for one to six sleuths.



Disk Tricks

An inside look at disk tracks and sectors, including four effective "how to" programs.

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DELTA DRAWING.™ Have fun creating pictures and computer programs. Ages 4-Adult.

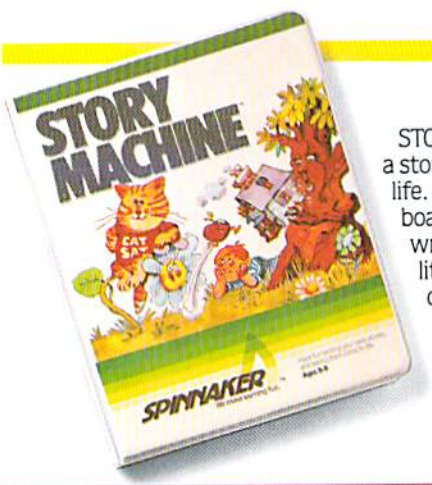
Kids love to draw. And DELTA DRAWING Learning Program lets them enjoy creative drawing and coloring while they learn computer programming concepts. As they use simple commands to put lines and colors in their drawings, they're actually writing computer programs!

With DELTA DRAWING, even kids who have never used a computer before can learn to do simple programming and build an understanding of procedural thinking. It's easy, clear, and lots of fun!

A trip through ALPHABET ZOO.™ Ages 3-8

It's a race. It's a chase. It's Alphabet Zoo, the exciting game that will have your kids zipping through the maze, after letters that fit the picture on the screen.

And at the same time, your kids will be learning the relationship of letters and sounds, and sharpening their spelling skills. So they'll be laughing and learning at every turn.



The story of STORY MACHINE.™ Ages 5 to 9.

STORY MACHINE is like a storybook come to life. Using the keyboard, your children write their own fun little stories. The computer then takes what they've written and animates their story on the screen, complete with full color graphics and sound.

STORY MACHINE helps your children learn to write correctly, become familiar with the keyboard, and lets them have fun exercising their creativity at the same time.

SPINNAKER™

We make learning fun.

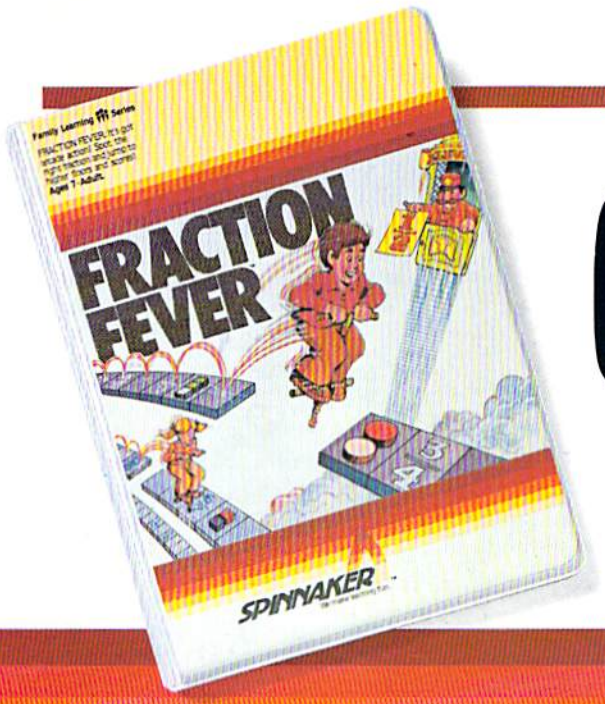
Disks for: Apple, Atari, IBM, Commodore 64.
Cartridges for: Atari, Commodore 64, IBM PCjr, ColecoVision.

SPINNAKER'S LINE OF EARLY LEARNING GAMES IS GROWING AS FAST AS YOUR CHILD'S MIND.

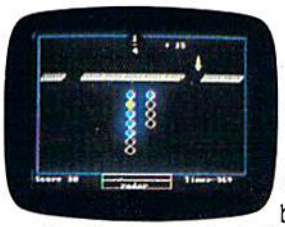
Watching your kids grow up is a lot of fun. But making sure their minds grow as fast as their bodies is even more rewarding. That's where we can help. With a growing line of Early Learning Programs that are not only lots of fun to play, but also educational.

Some of the games you see on these two pages help exercise your child's creativity. Others help improve vocabulary and spelling skills. While others improve your child's writing and reading abilities. And all of them help your child understand how to use the computer.

So if you're looking for computer programs that do more than just "babysit" for your kids, read on. You'll find that our Early Learning Programs are not only compatible with Apple,® Atari,® IBM® PC and PCjr, ColecoVision and Commodore 64™ computers, but also with kids who like to have fun.


Family Learning fff Series
FRACTION FEVER. It's got arcade action! Spot the right fractions and jump to higher floors and scores!
Ages 7 - Adult.
FRACTION FEVER
SPINNAKER

FRACTION FEVER™ brings fractions into play. Ages 7 to Adult.



FRACTION FEVER is a fast-paced arcade game that challenges a child's understanding of fractions. As kids race across the screen in search of the assigned fraction, they're actually developing a basic understanding of what a fraction is and of relationships between fractions. They're even discovering that the same fraction may be written in a number of different ways.

All in all, FRACTION FEVER encourages kids to learn as much as they can about fractions – just for the fun of it!

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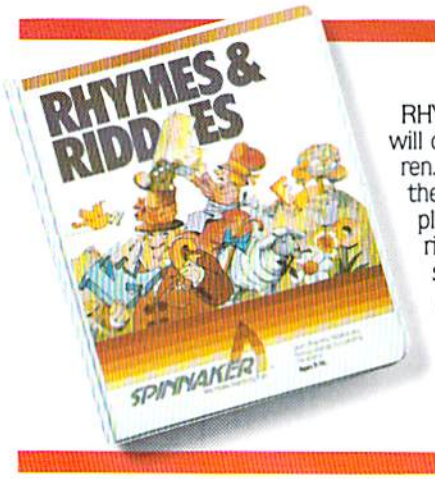


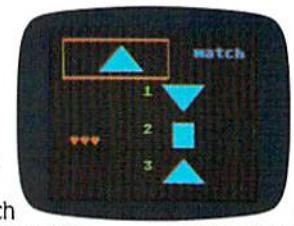
RHYMES & RIDDLES™ come to life. Ages 5 to 9.

RHYMES & RIDDLES will delight your children. Because when they successfully complete the rhymes, riddles, and famous sayings on the screen, they'll see them come to life–with music

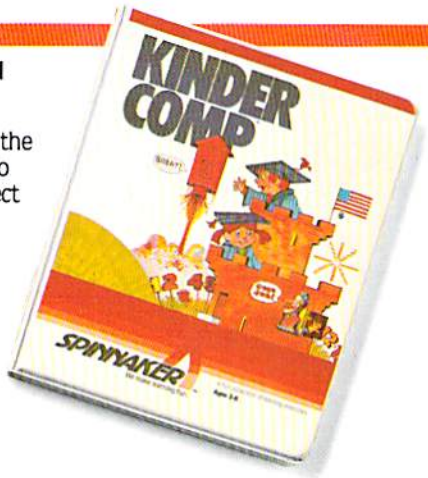
and colorful pictures. And RHYMES & RIDDLES not only teaches children the correct lyrics to nursery rhymes and famous sayings. It also helps kids learn to read and spell while they're having fun! That's why parents like RHYMES & RIDDLES, too!

KINDERCOMP.™ Numbers, shapes, letters, words and drawings make fun. Ages 3 to 8.

KINDERCOMP is a game that allows very young children to start learning on the computer. It's a collection of learning exercises that ask your children to match shapes and letters, write their names, draw pictures, or fill in missing numbers. And KINDERCOMP will delight kids with colorful rewards, as the screen comes to life when correct answers are given.



As a parent, you can enjoy the fact that your children are having fun while improving their reading readiness and counting skills.



FACEMAKER™ makes faces fun. Ages 4 to 12.

FACEMAKER lets children create their own funny faces on the screen. Once a face is completed, your children will giggle with delight as they make it do all kinds of neat things: wink, smile, wiggle its ears, or whatever their imagination desires.

Plus, FACEMAKER helps children become comfortable with computer fundamentals such as: menus, cursors, the return key, the space bar, simple programs, and graphics. FACEMAKER won't make parents frown because their children will have fun making friends with the computer.

SPINNAKER™
We make learning fun.

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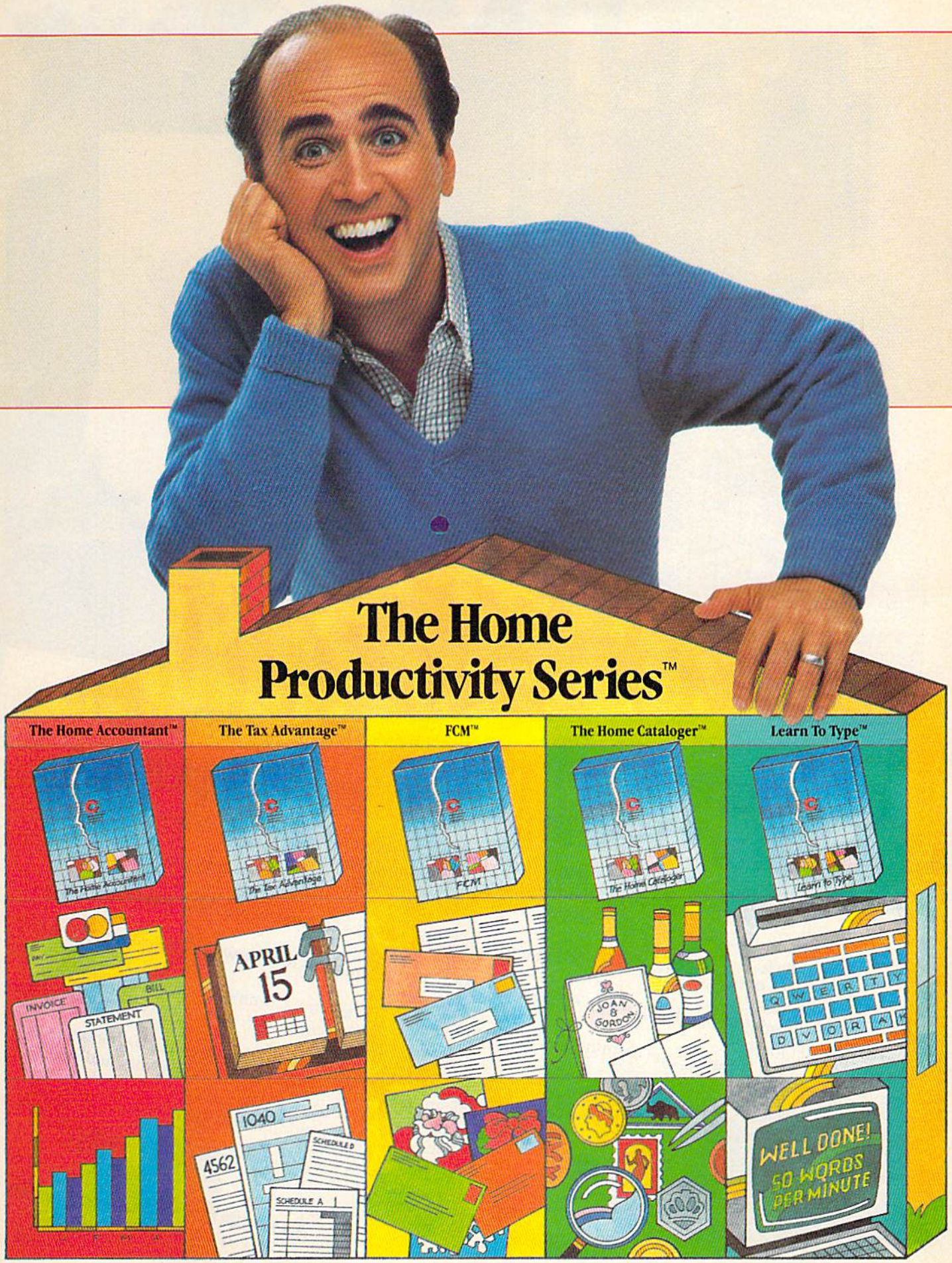
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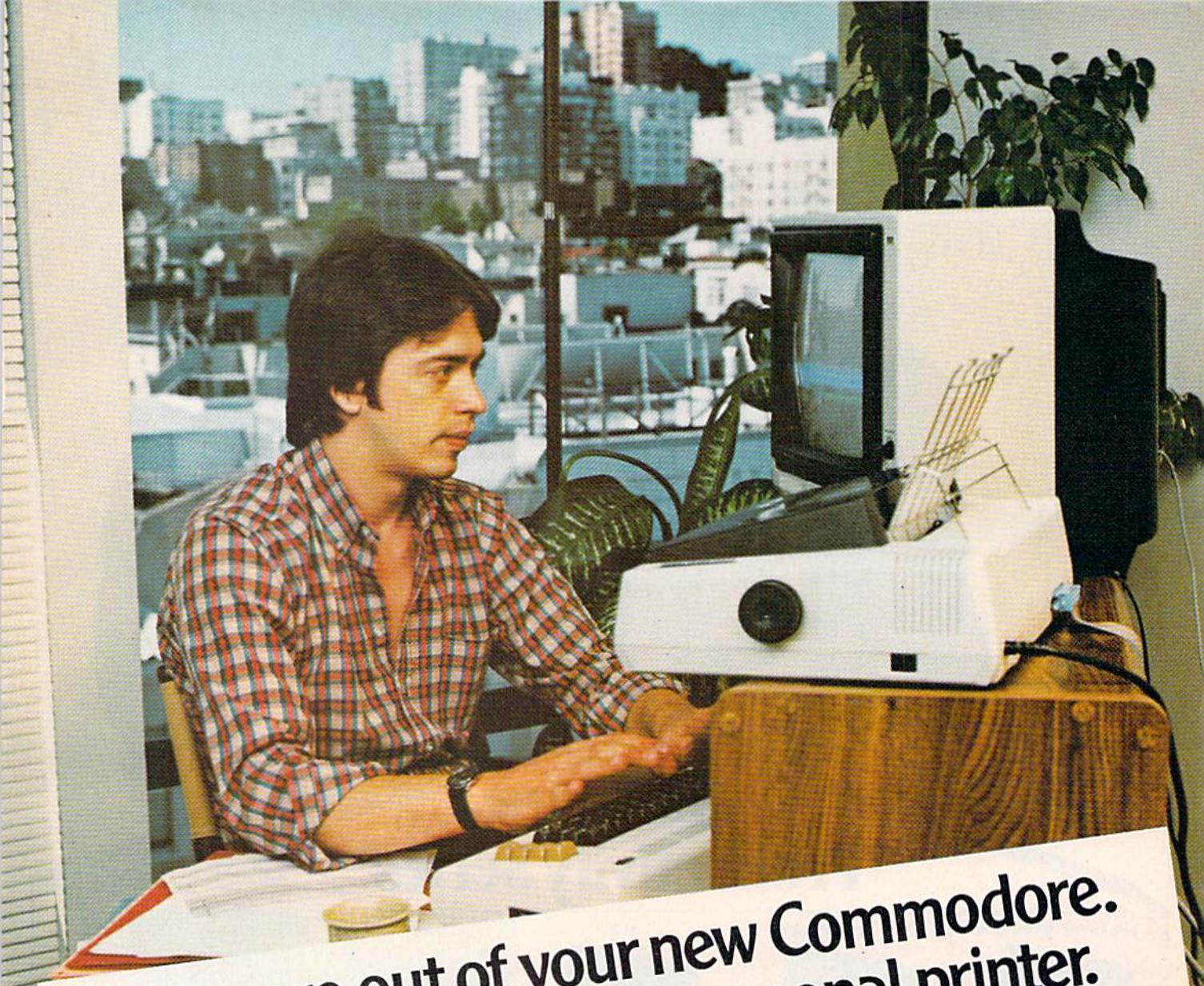


Get more out of your new Commodore. Get Star's Gemini-10X personal printer.

"My Commodore* computer really helps with my marketing business. It does just about everything but type and lick envelopes. Which would be nice for all my direct mail.

"Well, my Gemini printer solves the typing problem. And it's made to connect right to my Commodore.

"I've used it for typesetting ads and even printing letters. The type is the most solid dot matrix I've ever seen.

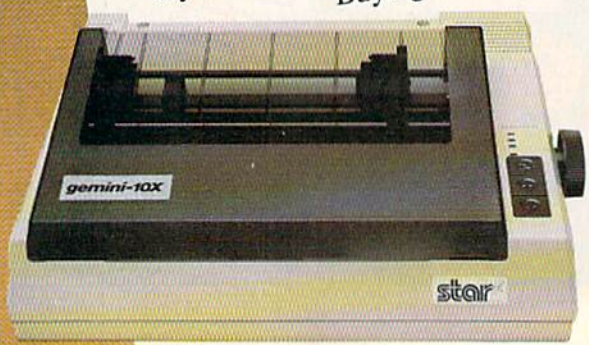
"And it's great having both Commodore and Gemini graphics to play with. I've even designed my own logo.

"Buying the Gemini-10X was a good move. It made my Commodore a better computer."

Steven Clarke—San Francisco, California

With Star's Gemini-10X printer you get 120 characters per second of clean, crisp type, multi-function versatility and steady, dependable service. All at a price that works.

It's everything you need in one printer.



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With The Home Productivity Series,™ I saved money on our taxes, figured out our net worth, cataloged my wine collection, sent out 253 Christmas cards, and taught our kids to type.

Think of The Home Productivity Series as your personal survival kit. It will make your computer an indispensable tool and open up a whole new world for you and your family.

The Home Accountant™

Do you ever wonder why your paycheck never seems to last as long as it should? Or why you're never able to save as much as you'd like—even though you earn good money?

It's tough to keep track of each dollar. But unless you do, you'll never be able to gain control of your finances and get ahead.

The Home Accountant, #1 bestselling home finance package, is the best way there is to organize and maintain your financial records. Because it keeps tabs on every penny you spend and earn, you'll always know where you stand.

The Home Accountant flags transactions for tax time, prints net worth and financial statements, handles multiple credit cards and checking accounts and has up to 200* budget categories.

In fact, The Home Accountant has helped over 300,000 people master their finances and make their lives easier.

Price: from $74.95*

The Tax Advantage™

Do you dread doing your taxes? You don't have to anymore.

The Tax Advantage, another bestseller from The Home Productivity Series, makes doing your taxes a cinch. Even if you've never done your taxes by yourself or used a computer before.

As an added plus, The Tax Advantage works with The Home Accountant. So if you've been using The Home Accountant year-round, you can automatically transfer your records to The Tax Advantage and polish off your tax return in no time.

The Tax Advantage takes you line by line through the 1040 and other commonly used tax forms. Not only does the program explain every line, it automatically computes your taxes with each entry you make. So you can see how each line affects your overall picture. The Tax Advantage also does income averaging with a few simple commands.

Price: $69.95

FCM™

FCM is more than just the best mailing list program you can buy. It's the most versatile.

Because FCM is so flexible, you can create your own mailing labels and customize them to look the way you want. You can even add a special message line that says "Merry Christmas" for your Christmas card mailing. FCM can also print the address and message right on your envelope.

FCM works with many popular word processing programs, so you can automatically combine form letters with your mailing list. It's ideal for use in business as well as at home.

FCM is a great organizer and is super for remembering things. For instance, if you are planning a wedding or party, FCM will send out the invitations, record the RSVPs, arrange the seating, let you know whose gift you received and allow you to check off thank you notes. FCM is great to have around.

Price: from $49.95*

The Home Cataloger™

If you have a hard time getting organized, it's time to check out The Home Cataloger. It'll keep track of everything you own like books, wine collections, household inventories and video cassette/tape collections, to name a few.

Because it's such a flexible and easy to use program, The Home Cataloger is a terrific way to teach your children how to look after their belongings—while they learn how to use the computer.

To help you out, The Home Cataloger comes with 10 ready-to-use cataloging formats for some of the most common uses: telephone list, inventory, travel plans, restaurants, insurance policies, coins, growth (height and weight), running, studies, and book list. If you want additional categories, just add them on.

The Home Cataloger. It's the best way to organize your whole house.

Price: from $49.95*

*depending on hardware

Learn To Type™

If you don't learn to type, you'll be left behind by the computer revolution. But if your children never learn, the consequences will be worse.

When we developed Learn To Type, we made it as easy and unintimidating as possible. In fact, the beginning section of Learn To Type assumes you've never touched a keyboard before.

The program uses prompts to help you, and has a drill and practice section that rates you on words per minute, telling you which fingers are slow and which are fast. You can even test your progress with the fun to play game, Eraser Man.™ Kids love it!

Plus you've got a choice of the keyboard layout you want to learn to type from—DVORAK or QWERTY.

Don't be left behind. Get Learn To Type.

Price: $39.95

Stop by your nearest dealer and ask about The Home Productivity Series. It's a must for computer age survival.

Available for: Apple, IBM, Atari and Commodore computers. For other versions, check with your dealer or Arrays, Inc./Continental Software.

For more information and a free product brochure for The Home Productivity Series, call or write:

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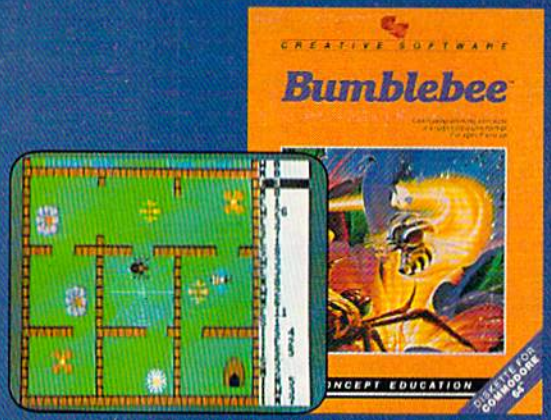
Bumblebee™

Dancing a Fine Line Between Innovative Game and Educational Tool



For Commodore 64™, IBM PC™ and IBM PCjr™, and Apple™

Bumblebee is a highly interactive game which provides learning in a fun environment. That's what we call Concept Education.

Bart the Bee will demystify the programming process and teach your kids basic concepts without complex computer language. The player controls Bart by giving him instructions on how to move from flower to flower, picking up "pollen points." Bart's flight pattern must be carefully designed to avoid bumping into walls or becoming an unfortunate meal for Olga the Spider or Phineas the Frog.

Bumblebee requires logical "if-then" thinking. Your child is rewarded for accuracy and expediency and challenged by increasing levels of difficulty.

We call it concept education. Your kids will call it fun.

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*=General, **V**=VIC-20, **64**=Commodore 64.

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EDITOR'S NOTES

It doesn't seem that long ago that we were writing a farewell editorial to Commodore founder Jack Tramiel as he left Commodore amid speculation of a rift that forced his departure. Official word at the time was that he wanted to withdraw from the field and travel the world. Right. As we are all now aware, Mr. Tramiel has completed negotiations with Warner Communications to purchase their struggling Atari computer operation. What does this mean for the industry in months ahead?

Ups And Downs

Jack Tramiel has unequivocally demonstrated his ability to understand, react, and even *drive* this market. He brought us, over the years, the first fully self-contained (single package) home computer. And, across those same years, as price points were successively broken down from the high hundreds of dollars to the high tens of dollars, his aggressive leadership and product introductions gradually broke down the industry as well. The roster of casualties ranged from Texas Instruments to a significantly weakened Atari—which moved from reliably delivering millions in profit for parent Warner to millions in losses to parent Warner.

In what must provoke a sense of Alice staring through the looking glass, we now have Mr. Tramiel buying, for what really amounts to promises of things to come (e.g., massive debt restructuring), a company that he beat down to affordability. It's an interesting world. One suspects that Mr. Tramiel—always the fiercest of competitors—may take some personal satisfaction in taking on his former namesake, Commodore, and those who implicitly or explicitly helped prod him out.

What Happens Now?

We expect there will be some senior level personnel changes at Atari. This has, in the past, been a significant "touch" of Jack's. We expect to see, in a matter of weeks or months, a gathering cloud of activity at Atari. A bit of price cutting perhaps? A hint of a new machine or two? Time will tell. Caution will have to be invoked somewhere along the line here, because, at least for now, there's a critical variable missing. A major factor in Commodore's success, and a key to Mr. Tramiel's ability to make the kinds of competition-crushing moves that gave him market leadership in the past, was what used to be a small, independent company named MOS Technology.

Commodore, aka Jack Tramiel, acquired MOS Technology back in the seventies in a stroke that eventually made them what they are today. Among other things, MOS brought us the 6502 microprocessor (long the heart of PETs, Apples, Ataris, etc.). And, more importantly, it brought Jack Tramiel the central nervous system of his philosophy of vertical integration. Over the years, his only competitor with the same capability for inhouse chip manufacturing was TI, and they never quite mastered the art the way Jack did. We would suggest that the ownership of MOS was crucial to his continued success by providing the controllable foundation for aggressive development and price control.

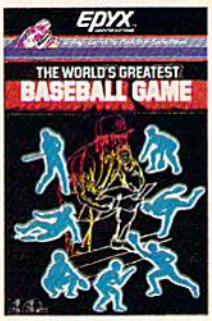
To this extent, the Atari acquisition suffers, but we expect it won't be fatal. Within the traces of microcomputerdom, Jack Tramiel is a skilled street fighter, and we suspect that, before the dust settles, an emerging Atari will return with vigor and vengeance.

Editor In Chief

THE WORLD'S GREATEST BASEBALL GAME. THERE'S MUCH MORE TO WINNING THAN JUST PITCHING, HITTING & FIELDING.

Real baseball is more than just hitting, pitching and fielding. It's also your favorite major league teams, the great stars of today and the Allstars of yesteryear. It's statistics and coaching, and it's managing your own game strategy. With the World's Greatest Baseball Game, you have it all. Pick your major league line-up using the actual player and team stats. Then watch the action unfold against an opponent or the computer. Two modes let you choose between managing and controlling your team or managing only. The World's Greatest Baseball Game—everything you could ever want except the hot dogs and peanuts.

One or two players; joystick controlled.



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COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

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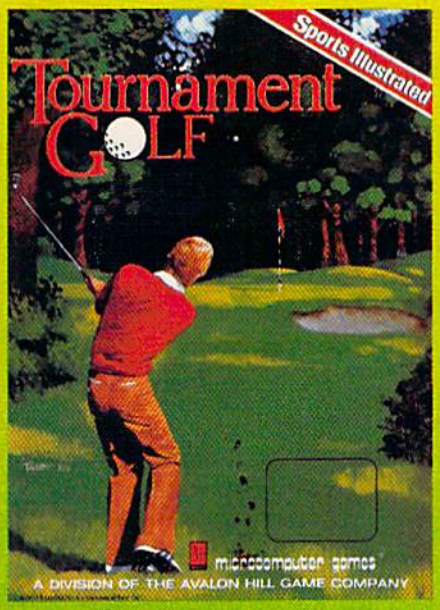

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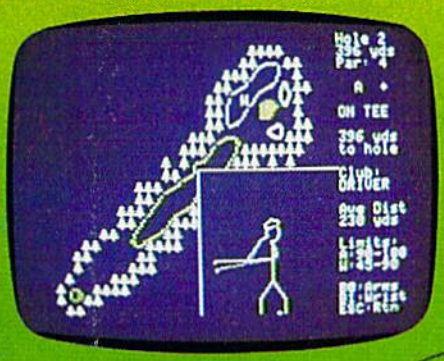

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GAZETTE FEEDBACK

Editors And Readers

Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

More On Disk Saves

In our July Feedback *column ("*Incomplete Disk Saves*"), we reported that use of the VALIDATE command will purge relative files. However, after several tests, we found that this command does not seem to adversely affect relative files. It appears that disks containing relative files* can *be validated; it is only random files that are purged.*

Read Only Memory

I own a Commodore 64, and I have two friends who own VICs. We would like to know if we can get into ROM and read the Read Only Memory.

R.K.C.

Read Only Memory (ROM) is just what the name implies—memory that can be read (PEEKed) but not written to (POKEd). ROM is used by the computer; the operating system is a good example of this. BASIC ROM (locations 49152–57343 in the VIC, and 40960–49151 in the 64) and Kernal ROM (locations 57344–65535 in both) contain the programs which control BASIC and the other functions of the computer.

Because these two blocks of memory are so important to the operation of the computer, they were designed so that you can't POKE new values there. Altering the contents of these locations would interfere with, or temporarily stop, the normal operation of the computer.

As the name implies, there is nothing to stop you from reading *the contents of ROM. Remember, however, that the ROMs contain only machine language. You can't LIST the contents as you would a BASIC program. You could use a* disassembler *program to make the machine language easier to interpret, but you will understand little of what you see unless you are familiar with ML.*

Elusive MPS-801 Printer Ribbons

As a recent purchaser of a Commodore MPS-801 printer, I've found that replacement ribbons are very hard to find.

For interested readers, I suggest using ribbon cartridges for the Radio Shack DMP-110 Printer, part number 26-1283 from Radio Shack. This ribbon is an identical replacement.

George J. Manning

Thanks for the tip. We purchased one of these ribbons and it seems to work well with the MPS-801. We continue to receive many letters about the availability of MPS-801 replacement ribbons. Our readers can surely use this information.

Machine Language POKEs

I am just starting to program in machine language. I would like to know the machine language equivalent of the BASIC POKE statement.

Jeff Schiller

The machine language equivalents of the BASIC POKE are the store instructions (STA, STX, and STY). These will store (copy) the contents of the accumulator (STA) or the X or Y registers (STX, STY) into the memory location you specify. The general format for these instructions is: STr $address *(where* r *is the register, and* $address *is the address in hex to be POKEd).*

For example, STA $C000 would store the current contents of the accumulator into location $C000 (decimal 49152), and STX $00 would store the contents of the X register into memory location zero.

You could simulate the BASIC statement POKE 53281,1 (which will set the Commodore 64's screen background to white) with:

```
LDA #$01
STA $D021
```

In addition to absolute stores, there are a variety of ways to use an index. For example, if the X register contains a three, STA $C000,x puts the number in the accumulator into $C003. By changing the value of X, you can create the machine language equivalent of a FOR–NEXT loop.

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PEEKing Time

I own a Commodore 64, and I am just starting to learn machine language. I have a question about the time (TI$) function. What location in memory do you look at to get the current value for the TI$ function?

Corey McKinnon

BASIC's time variables (TI$ and TI) return the current value of a built-in interval timer. PRINT TI returns a numeric value showing the current timer count in increments called jiffies, *where one jiffy is 1/60 second. Thus, to display the contents of the timer as seconds, you would type PRINT TI/60.*

PRINT TI$ returns the value of TI translated into a string of characters representing the time in hours, minutes, and seconds.

The interval timer is found at memory locations 160–162 (hex addresses $A0–$A2) in both the VIC and 64. Location 160 ticks once every 1092 seconds (65536 jiffies), location 161 ticks every 4.26 seconds (256 jiffies), and 162 ticks every jiffy (sixty times a second). BASIC determines the value of TI by performing the equivalent of:

```
TI=PEEK(160)*65536+PEEK(161)*256+PEEK(162)
```

It then determines the value of TI$ from the value of TI, so there are no locations which actually hold the current value of TI$. That is, there are no locations in the computer holding the time in hours-minutes-seconds format.

You can read the clock from machine language simply by examining the contents of locations 160–162. You can also use the built-in Kernal ROM routines RDTIM ($FFDE) to read the clock or SETTIM ($FFDB) to set it. See the VIC or 64 Programmer's Reference Guide *for more details. However, in either case, you will have to do some manipulating if you want the time in seconds instead of jiffies.*

You should be aware that the clock stops running during tape SAVEs and LOADs. If you set the clock and then perform one of these tape operations, the time value will be incorrect.

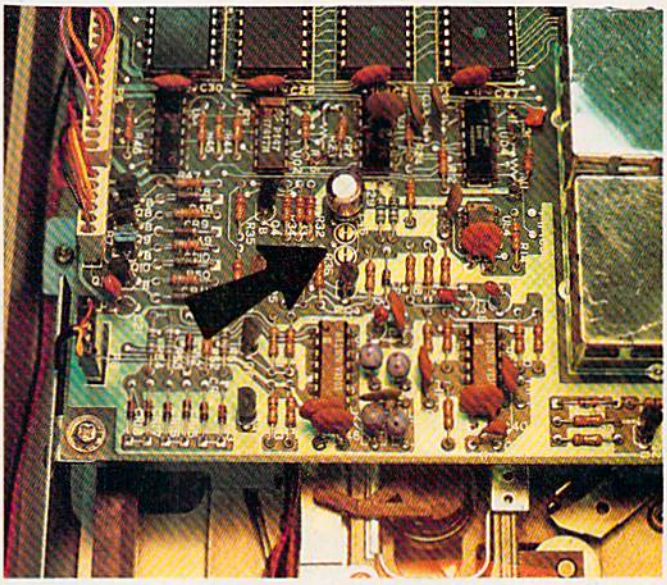
Disk Drive Device Number Change

I have two 1541 disk drives and want to change the address of one of them via the hardware method. I followed the instructions in the owner's manual, but can't tell which wires are the jumpers in question. Please help.

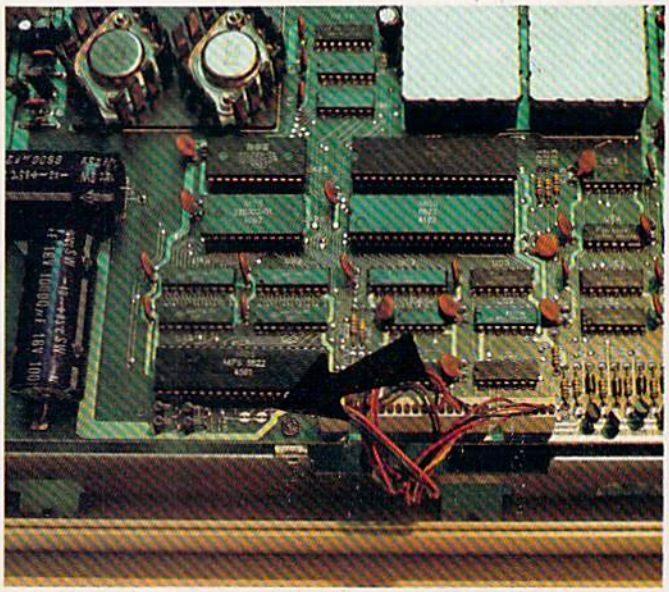
Nolan L. Green

The instruction manual's reference to jumpers might be misleading. The "jumpers" are actually two round disks of solder, each about 1/4 inch in diameter. Each disk is separated into halves, with a thin strand of solder connecting each half.

Unplug the power cord from the wall and open the disk drive following the instructions in the user's manual. On the older (white case) model 1541s, the jumpers are found on the left edge of the circuit board, just behind the long plugs with wires. On the newer (tan case) model 1541s, they are found near the center of the circuit board, toward the front. On both models, jumper 1 is nearest the front.



On the newer models, they can be found in the middle toward the front.



On the older 1541, the jumpers are on the left edge, to the rear.

Changing the device numbers is accomplished by taking a sharp, pointed object and scratching away the thin strand of solder connecting the two halves on one or both of the jumpers. Do this very carefully so as not to damage the circuit board or any other components.

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Here's a chart showing which device numbers are produced when the jumpers are cut:

JUMPER CUT	NEW DEVICE NUMBER
None	8
1	9
2	10
1 and 2	11

Changing the disk drive device numbers via the hardware method is permanent unless you're handy with a soldering iron. So don't do so unless you have to. If you're unsure about exactly what you're doing, have your local Commodore dealer do the modifications for you.

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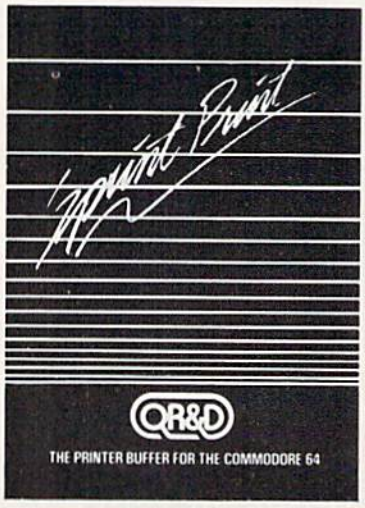

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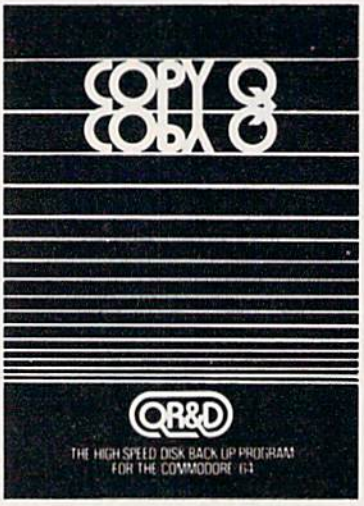

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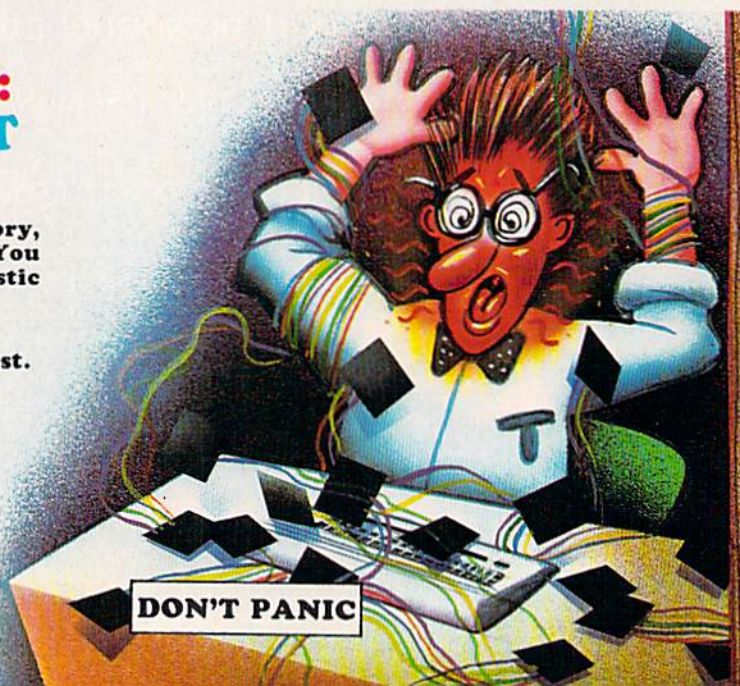

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The Summer Consumer Electronics Show:

A Smorgasbord For The 64

Lance Elko, Editor

Nearly 100,000 eager people crowded Chicago's McCormick Place at the Summer CES to see what's new in computers and audio and video electronics. For Commodore 64 owners, there's a lot of good news. Not so for VIC owners. Here's a summary of new products and trends, and what to look for in the months ahead.

The feast is on for owners of the Commodore 64. The Summer Consumer Electronics Show (CES) held this June in Chicago introduced a spread of new software and hardware that will delight (and perhaps bewilder) 64 owners.

This new wealth of choice is a testament to the growth of a computer regarded by some industry experts as a toy. "People have equated low cost with low quality," says Neil Harris, Commodore's new product design manager. But the success of the 64 has surprised even Commodore.

What worked against the 64 in its early days was the lack of software—not a problem with some other home computers, such as the Apple. But the 64 outlived a year of software famine. By Christmas of 1983, consumers had a fair choice of a lot of average programs and a few really good ones. As the 64's popularity continued to grow into the new year, more and better software entered the market. Innovative design and programming, exploiting all the 64's features, translated into hotter competition for the consumer's software dollar. And this culminated at CES in a colossal smorgasbord of new products.

Although 64 owners now have a bigger and better menu, the news was not so bright for VIC-20 owners. Commodore says it stopped manufacturing VICs in the Spring, and that leftover inventories probably would be sold by Fall. VIC users will have to be satisfied with software that's already available, write their own programs, or buy another computer. A few new products were announced for the VIC at CES, but you could count them on one hand. According to one Commodore representative, VIC sales in the U.S. had been dropping dramatically, while the 64 grew to dominate the low-end market.

Commodore presented two new computers at CES: the Commodore Plus/4, originally introduced as the Commodore 264 at the January CES, and the Commodore 16, a scaled-down version of the Plus/4. Plans for the 364, also announced in January, have been shelved.

The Plus/4 is an interesting machine and somewhat of a departure for Commodore. Named

Commodore's new Plus/4 is aimed at the more applications-oriented user.

The Commodore 16 hopes to pick up the low-end market where the VIC left off.

for its four built-in programs—a data base manager, spreadsheet, word processor, and business graphics package—the Plus/4 has been dubbed "the productivity machine."

"Some people want practical applications and less fun and games," explains Harris. The built-in software, originally titled *3 + 1* and designed by Tri-Micro, is integrated so that you can use *File Manager* (the data base manager) or the spreadsheet with the word processor. And *Graphics* is designed so you can display graphs from calculations performed with the spreadsheet.

Although some people feared the Plus/4 would replace the 64, Commodore contends the new machine is aimed at a different audience—those whose primary needs are for business applications. The Plus/4, however, contains a few of the features of the 64: eight function keys, the keyboard graphics character set, and a 320 × 200 pixel high-resolution graphics screen. What's different is a new BASIC (known as 3.5) which adds new commands (75 in all), including 11 graphics commands similar to those available with Simon's BASIC and the 64 Super Expander. It has 64K of memory, with 60K of that available for BASIC programming. Like the Commodore 64, the Plus/4 has 16 colors, but each one now has eight luminance levels for a total of 128 separate hues. Screen windowing capability and a 12-command machine language monitor are also included.

The keyboard has a different look and feel from the 64. The function keys, one of which is labeled HELP, are placed horizontally above the keyboard. Four separate arrow-shaped cursor keys should eliminate the tedium of SHIFTing when editing on the screen. A second CONTROL key is in place of the RESTORE key found on the 64, and an ESCAPE key has

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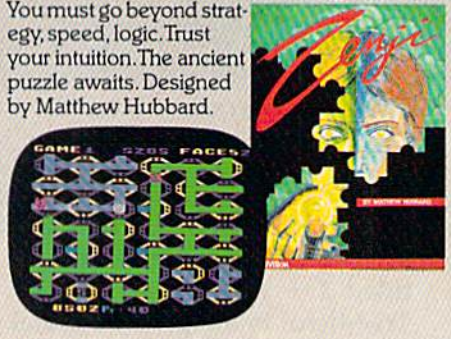
You have heard the elder speak of one central source and a maze of unconnected grey paths. As you connect each grey path to the central source, what was grey becomes the green of life. When all are connected, then you have achieved "Zenji." But beware the flames and sparks of distraction that move along the paths. You must go beyond strategy, speed, logic. Trust your intuition. The ancient puzzle awaits. Designed by Matthew Hubbard.



You strap on your helicopter prop-pack, check your laser helmet and dynamite. There's no predicting what you'll have to go through to get to the trapped miners. Blocked shafts, molten lava, animals, insects, who knows what lies below. But you'll go, you're in charge of the Helicopter Emergency Rescue Operation. The miners have only one chance. You. The opening shaft is cleared now, it's time to go. Designed by John Van Ryzin.

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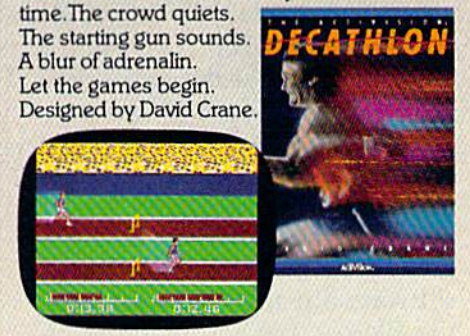

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been added above the left CONTROL key.

Perhaps to further differentiate the Plus/4 from the 64, Commodore has left out sprites and the SID synthesizer chip. Instead, the Plus/4 has a tone generator similar to the VIC's, but with improved pitch accuracy.

The Commodore 16 (for its 16K RAM) is effectively a stripped-down version of the Plus/4. Dubbed "the learning machine" by Commodore, the 16 contains the same BASIC 3.5 as its bigger brother as well as the built-in machine language monitor and screen windowing capability. A rear port allows memory expansion up to a full 64K. Commodore sees this machine as a replacement for the VIC-20 and as an entry level computer for novices who aren't sure about spending a lot of money. Commodore will offer a variety of educational and recreational programs for the 16. It should be available this Fall and sell for about $100. The Plus/4 should appear at the same time for about $300.

Third-party software support will depend on the computer's fate in the marketplace. Obviously, there won't be a great demand for the kind of software already packaged with the Plus/4, but Commodore has already announced over 40 programs for the new machine. Many of the new titles are revisions of 64 programs: *General*

Learning, Learning Everywhere:
Educational Software For Commodore From CES

Selby Bateman, Features Editor

If you own a Commodore 64, prepare to get educated. June's Consumer Electronics Show in Chicago included dozens of companies with hundreds of educational software packages for the Commodore 64 computer. Here's a brief look at some of the players and programs from CES.

There's an educational emphasis throughout the entire microcomputer market, says Neil Harris, new program design manager for Commodore.

"Educational programs now exploit the computer," he says. "And educational games have caught up to [entertainment] games in quality."

Harris ought to know. He has seen firsthand how the attractiveness of the Commodore 64's huge installed base has translated into a flood of educational programs targeted toward users of the machine. And these packages take a variety of forms: curriculum-based software, educational games, "edutainment" packages, drill-and-practice programs—the list is extensive and confusing.

The range of companies producing these programs is also wide. They include small start-up firms composed of current or former educators, large productivity or entertainment software producers who are entering the educational market, and established educational book publishers who want to carry their reputations and expertise into the computer field.

As most software producers will admit, the quality of all these products varies tremendously. And even among well-produced educational programs, the target audiences must be carefully selected. But, in general, the fierce competition among educational software producers appears to be creating a higher level of quality in recent program offerings. And concerned educators are having more of an effect on the market as a whole. (See next month's GAZETTE for a look at some of the new directions in educational software.)

Here, then, are a few of the companies and their educational products for the Commodore 64:

American Educational Computer—This Palo Alto, California, based company is one of the largest developers and publishers of curriculum-based educational software for the school and consumer markets.

At CES, AEC introduced a series of advanced spelling programs for use on the 64 and other home computers. Called

Why settle for less when you can have Mo?

Introducing Mitey Mo, the ready-to-go modem that turns your Commodore 64® into a telecommunications giant.

Mitey Mo is the complete—and affordable—telecommunications system for your Commodore 64. It will open up a world of practical and exciting uses for your computer, and it will take you online faster and easier than anything else you can buy.

Now you'll be able to send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, do electronic banking, and tap into library resources to find the material you need for your reports. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for the C-64. Like Mitey Mo, it has "auto-answer"— it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where their similarity ends.

Suppose you dial a number,

and you find that it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu-driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu-driven, you'll be hunting through the manual a lot.

Mitey Mo has only one switch, the customized software does the rest. Every family member will find it easy to use. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

Mitey Mo gives you access to twelve pages of memory (24,000 bytes), so you can store data and review or print it later. The other modem doesn't let you store or print anything.

Mitey Mo is half the size of the other modem. The very latest technology allows miniaturization and increased reliability, as well. Mitey Mo is so reliable, we gave it a three-year warranty. The other modem gives 90 days, then you're on your own.

Not only will you find Mitey Mo mighty useful, you'll find it mighty reasonably priced. When you consider how much more you get for the money, there's really no other choice.

MODEM FEATURES	USI MITEY MO	COMMODORE AUTOMODEM
Auto Dial	YES	YES
Auto Answer	YES	YES
Auto Redial	YES	NO
Smooth Screen Scrolling	YES	NO
Both Cassette and Diskette Software Included	YES	NO
Menu Driven	YES	NO
24K Software Buffer	YES	NO
Function Key Template	YES	NO
Printing Capability	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Dual Cables Included	YES	NO
Single Switch Operation	YES	NO
Warranty	3 years	90 days

Some mighty interesting features—ours and theirs. Yours to decide.

USI

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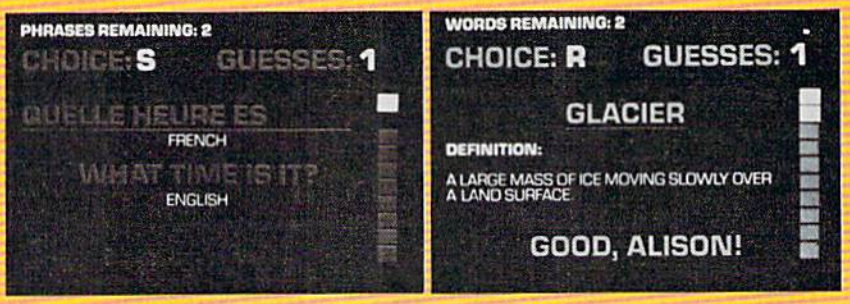

The Matchmaker Series from American Educational Computer uses a variety of quiz formats to address most subjects in standard elementary and junior high curricula.

Ledger, Logo, Zork I, II, and *III, Wizard of Wor, Gorf, Deadline, Magic Desk II, Easy Script/Plus, Easy Calc/Plus,* and others.

A brand new offering exclusively for the Plus/4 is a series called "vertical market application templates." These disk-based programs are designed for specific applications such as manufacturing, the retail industry, personal financial planning, construction, maintenance and service, and professional services. A variety of new educational programs for the Plus/4 will also be available.

Disk-based software for the Plus/4 will run on the new parallel-interface SFS 481 disk drive (not 64 compatible). This drive is significantly faster than serial-interface 1541 disk drives. A new letter-quality daisywheel printer, the DPS 1101, is also designed for the Plus/4. It prints at 18 cps (characters per second) and features proportional spacing which can be selected manually from the front of the machine.

Several other printers were announced by Commodore: the MPS 802, a bi-directional impact dot matrix printer which can print at 60 cps; the MCS 801 color dot matrix printer (see "Horizons 64" elsewhere in this issue for a close-up look); and the MPS 803, a dot matrix printer designed for use with the Commodore 16.

Other new hardware includes the 1531 Cassette Unit

AEC Spelling, the new software teaches the spelling of over 4000 words and allows the user to enter additional words. Using a test-teach-test method of instruction, the spelling series addresses the needs of students in grades two through eight.

AEC also announced the second generation in its Matchmaker series on subjects in standard elementary and junior high school curricula. Aimed at Commodore 64 and other personal computer users at home, the series includes coverage of U.S. Government, World History, Biology, French, and Science I, II, and III. (American Educational Computer, Inc., 2450 Embarcadero Way, Palo Alto, CA 94303.)

DLM Teaching Resources (Developmental Learning Materials)—A publisher of educational materials for more than 15 years, DLM has numerous titles in its series of "Arcademic" Skill Builders and Drill Builders for grades one through six. Among its packages for the 64 are *Alien Addition, Meteor Multiplication, Demolition Division,* and *Dragon Mix,* all using colorful graphics and action game formats to interest children. (DLM Teaching Resources, P.O. Box 4000, One DLM Park, Allen, TX 75002.)

Koala Technologies—In association with Henson Associates, Inc. (creators of the Muppets) and Sunburst Communications, Koala (producer of the popular Koalapad) introduced a

The Muppet Learning Keys computer keyboard from Koala Technologies teaches the alphabet, numbers, colors, and shapes to children three years and older.

ATARISOFT. All the hits your computer is missing.

It's showtime.

Time for ATARISOFT™ to show you six exciting, brand new games that are destined for stardom.

Games that can be played on your Commodore 64, IBM PC and Apple II. (Some titles available on IBM PC jr. and VIC 20:*)

First, there's *Gremlins*[1], based on the characters from the original film presented by Steven Spielberg.

Then there's *Crystal Castles*™ where Bentley Bear™ journeys through all sorts of tantalizingly difficult paths and ramps in his endless quest for gems.

In *Donkey Kong Jr.*[2] by Nintendo[2], Junior tries to rescue his father against immense odds. And speaking of Donkey Kong, there's also *Mario Brothers*[2] by Nintendo[2]. This time, Mario and his brother Luigi battle creatures on four levels of floors, encountering all sorts of treacherous enemies.

In *Track And Field*[3] you can compete by yourself or head-to-head with another player. But each player must beat qualifying times, heights and distances before they can compete in each of the gruelling six events.

Typo Attack is the much-acclaimed, fun-filled program that allows you to enjoy developing your typing skills at any level.

And still playing to the delight of audiences everywhere are *Pac-Man*[4]; *Ms. Pac-Man*[4]; *Jungle Hunt*[5]; *Battlezone*™; *Donkey Kong*[2]; by Nintendo[2]; *Centipede*™ and *Pole Position*[6].

So, if you've been searching for ways to entertain your Commodore, Apple or IBM, treat it to one of the best shows in town, one of the hits from ATARISOFT.

And don't forget the popcorn.

GREMLINS

FROM ATARISOFT

MARIO BROS. ATARISOFT APPLE II

DONKEY KONG JR. ATARISOFT IBM PC

TRACK & FIELD ATARISOFT COMMODORE 64

CRYSTAL CASTLES ATARISOFT APPLE II

TYPO ATTACK ATARISOFT IBM PCjr

ATARISOFT products are manufactured by Atari, Inc. for use with various computers and video game consoles. ATARISOFT products are not made, licensed or approved by the manufacturer(s) of those computers and video game consoles.

*Titles available on IBM PC jr. are Ms. Pac-Man, Centipede, Donkey Kong, Moon Patrol[7] and Typo Attack. Available on the VIC 20 is Typo Attack.

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ATARISOFT

SIX NEW HITS ARE COMING SOON TO A COMMODORE 64 SCREEN NEAR YOU.

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and the 141 Color Monitor. Both are color coordinated (charcoal gray) to match the 16 and the Plus/4, but are also compatible with the VIC and 64.

Despite the variety of new hardware from Commodore and third-party companies, the mountain of new software drew the most attention at CES. Especially abundant are productivity software and new educational programs (see the accompanying article, "Learning, Learning Everywhere").

Commodore 64 owners can choose from a wide assortment of productivity packages—personal financial programs, data bases, word processors, spreadsheets, and more. Cardco introduced two packages, *File Now*, an easy-to-use data base, and *Graph Now/Paint Now*, a graphics package designed for generating line and bar graphs, and color art. Each is on disk and sells for $39.95. They are fully integrated with Cardco's *Write Now!* word processor and round out their productivity series, which also includes *Mail Now* and *Spell Now*.

Creative Software announced an integrated productivity series which includes *Creative Writer, Creative Filer, Creative Calc*, and *Creative Finance*. Retail for each is $49.95. The company also introduced *EasyDisk*, a menu-driven utility program for the 1541, which enhances and extends the drive's operating system. The price is $29.95.

children's computer keyboard, Muppet Learning Keys, at CES.

The keyboard attracted much attention at the show, and is available for the Commodore 64 and Apple II family of computers. Preschoolers can learn basic letter, number, shape, and color skills by using the keyboard which plugs into the joystick port on the 64.

Popular Muppet figures such as Miss Piggy, Gonzo, and Kermit the Frog help to attract the child to learning. Each section of the school desk-like keyboard—ruler, water color set, penmanship slate, compass, eraser, and arithmetic exercise book—can be activated by the touch of a child's finger. (Koala Technologies Corp., 3100 Patrick Henry Drive, Santa Clara, CA 95052-8100.)

The Learning Company—One of the most respected names in quality educational software is the Texas-based firm, The Learning Company, most of whose titles have been for Apple computers.

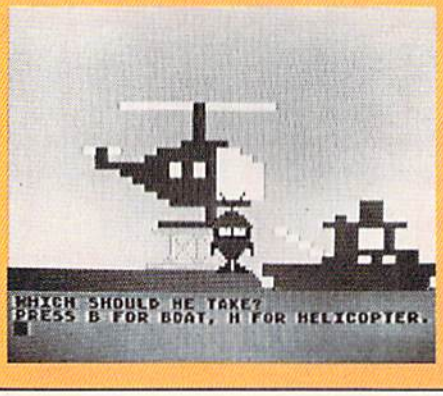
The company has now converted several titles for the 64. There are two programs in The Learning Company's Reading Series now available for the 64: *Juggles Rainbow*, in which children from three to six play with dancing rainbows and whirling windmills to learn reading and math readiness skills; and *Word Spinner*, in which youngsters from six to ten learn the basic building blocks of reading.

Also available for the 64 is *Addition Magician*, a game that teaches children from six to ten the basic concepts of addition and doubles as a number strategy game for older children; and *Moptown Parade*, an electronic logic and discrimination game. (The Learning Company, 545 Middlefield Road, Menlo Park, CA 94025.)

MECC (Minnesota Educational Computing Consortium)—One of the leading publishers of educational software for schools, MECC has more than two dozen educational titles for the 64 and several more coming out this fall. Among the courseware products to be released this fall for the 64 are *Adventures With Fractions; Earth Science; Pre-Reading; The Glass Computer*, which reveals and demonstrates how computers and the BASIC programming language work; *Outdoor Biology*, and *Electronic Money*.

MECC's products include both curriculum-based classroom software and a Home Software Library. (MECC, 3490 Lexington Avenue, St. Paul, MN 55112.)

Mindscape, Inc.—Mindscape is an electronic publishing subsidiary of SFN Companies, one of the nation's leaders in elementary and high school textbook publishing.



Tink's Adventure, part of Mindscape's Sprout line of software for children, incorporates five multilevel learning games as it teaches the alphabet and the computer keyboard.

OUR STORIES LACK IMAGINATION.

Because Infocom's interactive fiction is designed to run on *your* imagination.

That's precisely why there's nothing more interesting, challenging or interactive than an Infocom disk—but only after you've put it in your computer.

Once it's in, you experience something akin to waking up inside a novel. You find yourself at the center of an exciting plot that continually challenges you with surprising twists, unique characters (many of whom possess extraordinarily developed personalities) and original, logical, often hilarious puzzles. Communication is carried on in the same way as it is in a novel—in prose. And interaction is easy—you type in full English sentences.

But there is this key difference between our tales and conventional novels: Infocom's interactive fiction is active, never passive. The course of events is shaped by what you choose to do. And you enjoy enormous freedom in your choice of actions—you have hundreds, even thousands of alternatives at every step. In fact, an Infocom interactive story is roughly the length of a short novel in content, but because you're actively engaged in the plot, your adventure can last for weeks and months.

Find out what it's like to get inside a story. Get one from Infocom. Because with Infocom's interactive fiction, there's room for you on every disk.

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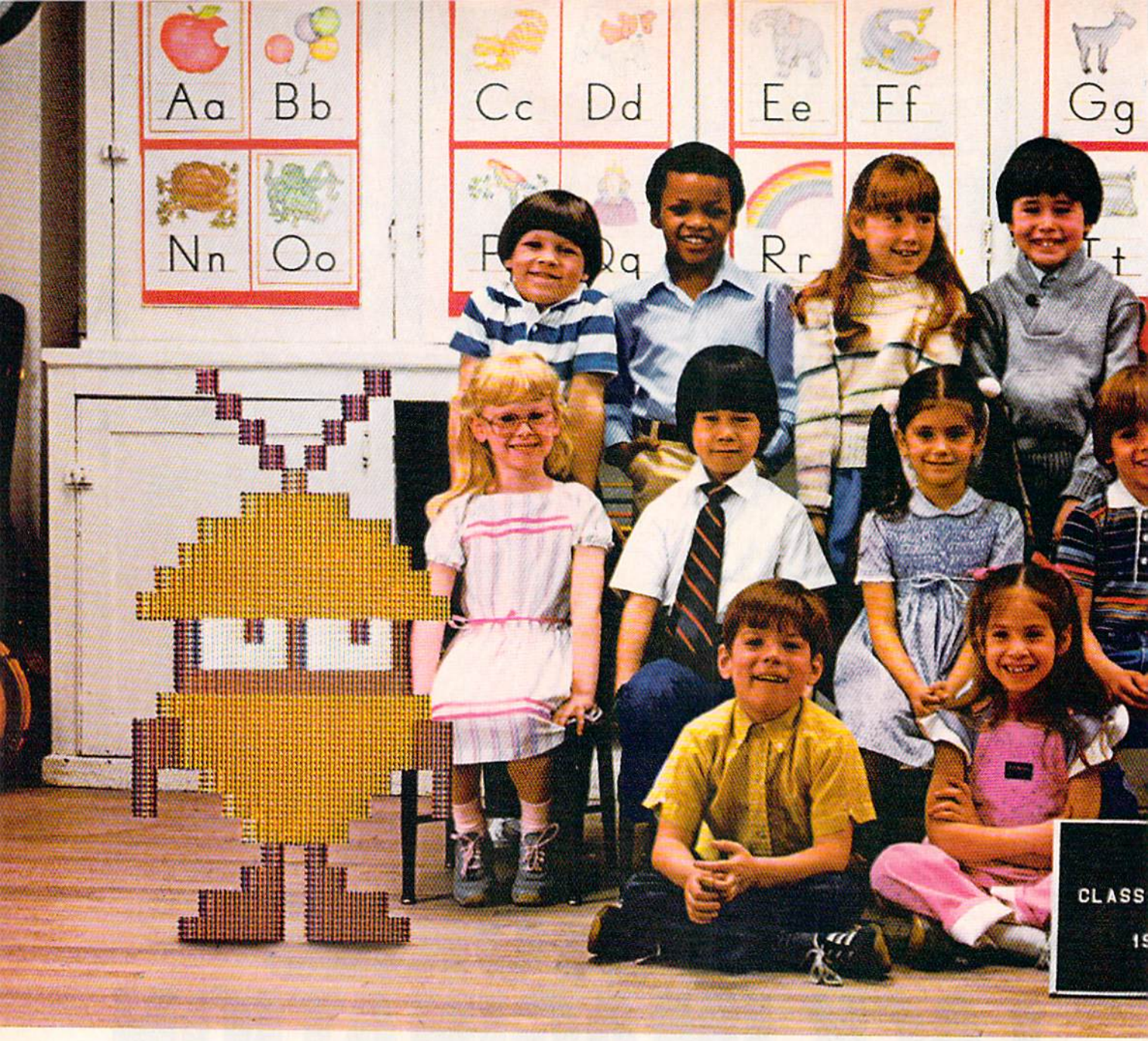
For your: Apple II, Macintosh, Atari, Commodore 64, CP/M 8", DECmate, DEC Rainbow, DEC RT-11, HP 150 & 110, IBM PC* & PCjr,* KAYPRO II, MS-DOS 2.0,* NEC APC, NEC PC-8000, Osborne, TI Professional, TI 99/4A, Tandy 2000, TRS-80 Color Computer, TRS-80 Models I & III.

*Use the IBM PC version for your Compaq and the MS-DOS 2.0 version for your Wang, Mindset, Data General System 10, GRiD and many others.



Modern times have create

We've cleverly disguised them as funny creatures from a computer game. But underneath the funny exterior is one of the most serious approaches to home education you've ever heard of.

INTRODUCING SPROUT™ SOFTWARE.
GAMES THAT TEACH.

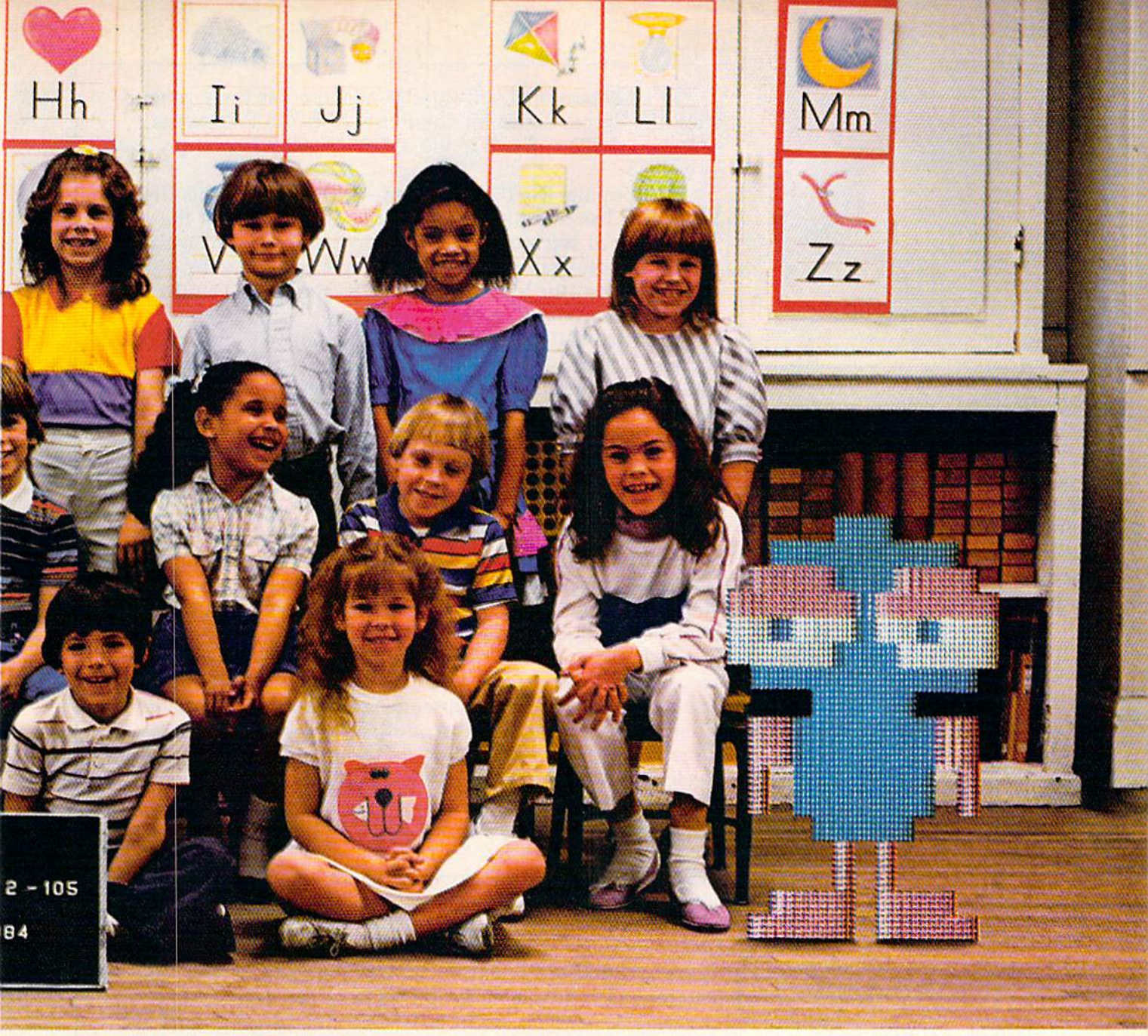
Your kid's new teachers are called Tink and Tonk. They come from Sprout. Software for kids 4 to 8.

The beauty of Sprout software is how entertainment is balanced with a healthy dose of education.

While kids are having fun at home, they're actually reinforcing what they've learned at school. Things like the alphabet, spelling, vocabulary, counting, adding, and pattern recognition.

You'll also like how Sprout prevents boredom. Our games grow up, instead of wear out. As kids get older, the game adjusts and gets harder. Because there are many

TINK!TONK! characters © 1983 TINK TONK, Inc. All rights reserved. TINK!TONK! is a trademark of TINK TONK, Inc. Sprout is published by Mindscape, Inc., Northbrook, Il. 60062.



d a new breed of teachers.

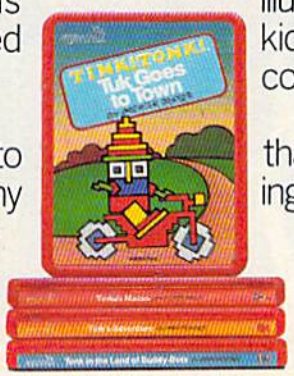
variations and many decisions to make.

Knowing how to do all this isn't something Sprout learned overnight.

You see, we've got a hundred years of experience to lean on. (Our parent company is SFN, the country's #1 textbook publisher for elementary and high schools.)

We've also got the experience of Mercer Mayer, who has written or illustrated 80 children's books. He dazzles kids with ideas and pictures that keep them coming back for more.

With TINK!TONK!™ software, kids see that learning can be more fun than destroying space creatures.



sprout

Games that grow up. Instead of wear out.

Compatible with Atari®, Commodore®, Apple®, and IBM.®

HomePak, a three-in-one utility program from Batteries Included, offers *HomeText*, a word processor, *HomeFind*, a data base, and *HomeTerm*, a terminal program also designed for use with the major information networks. *HomePak* comes on a single disk and sells for $49.95. Also new from Batteries Included is *Stress Manager*, a biofeedback monitoring system, which includes software, an interface between the user and the computer, and an audio cassette. The software analyzes fluctuations in the skin's electrical conductivity and displays graphs which can then be interpreted by the user. It sells for $79.95.

Another new three-in-one integrated package is *TRIO* from Softsync. This disk-based program includes a word processor, data base, and spreadsheet, and sells for $69.95.

Professional Software launched their Soft Fleet series designed just for the 64. It includes *Fleet Writer*, *Fleet Speller*, and *Fleet Filer*. Prices will be announced.

An interesting product from HesWare is *Graphics Basic*, a utility which extends BASIC with 48 commands. It can be used to design business graphs or games, and includes the capability for split screens and windows. The price is $29.95.

Continental Software's new Get Rich! Series is a set of five programs—*Strategies*, *Real Estate Planning*, *Insurance Planning*, and *Retirement Planning*— each

In its educational software, Mindscape has three product lines: the Sprout series for children 4 to 8, the Pixelwerks series for children 8 to 12, and a teen-to-adult line of products as well.

The popular Tink!Tonk! series—with Tink and his friends Tinka and Tuk and his dog, Tinkypup—are a part of the Sprout line of software. They were written by award-winning author and illustrator Mercer Meyer and developed by Angelsoft, Inc., for Mindscape. (Mindscape, 3444 Dundee Road, Northbrook, IL 60062.)

Prentice-Hall (Arrakis Advantage)—The Canadian-based Arrakis Systems, Inc., has developed a line of high-quality educational curriculum-based home software which will be distributed by Prentice-Hall.

The first 18 modules in their line of Commodore 64 software include algebra, biology, chemistry, geometry, physics, and statistics. Eventually, a complete curriculum will be developed by Arrakis. (Prentice-Hall,Inc., Rt. 9W, Englewood Cliffs, NJ 07632.)

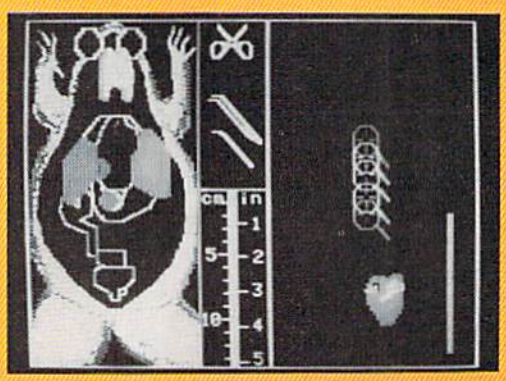
Scarborough Systems, Inc.—This well-known Tarrytown, NY-based company has concentrated on producing a limited line of high quality software, from which several programs are available for the Commodore 64.

Included are *Songwriter*, a music education program for ages five to adult; *Patternmaker*, an art construction set for ages six to adult (available in September); *MasterType*, a popular typing tutorial for ages six to adult; and *Laser Shapes*, a math game using laser beams, color, and sound, for ages 7 to 15 (available in September). (Scarborough Systems, Inc., Tarrytown, NY 10591.)

Scholastic Software—A division of Scholastic, Inc., a major educational publisher for over 65 years, Scholastic Software has developed a line of "fun-learning" game-oriented educational packages.

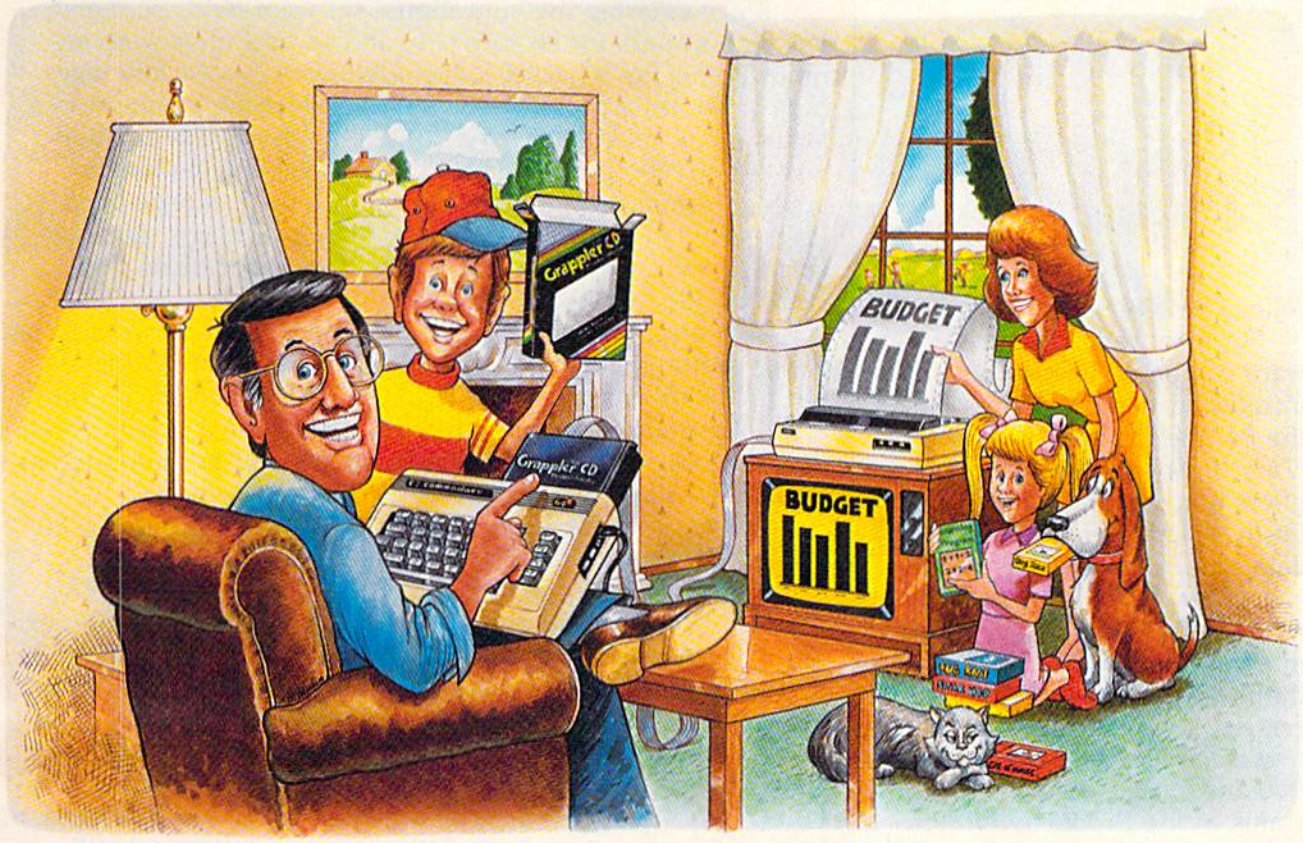
Among its new products at CES, Scholastic introduced *Operation: Frog*, an interactive computer simulation of a frog dissection, which was developed by Interactive Picture Systems. It will be available for the 64 later this fall.

Scholastic also announced at CES that its geography action game for children nine years and up, *Agent USA*, developed by educational software designer Tom Snyder, has been made available for the 64. And the reading adventures program, *Tales of Discovery* (for children 9 to 13), will be available for the 64 in early 1985. (Scholastic, Inc., 730 Broadway, New York, NY 10003.)



A computer simulation of a frog dissection is part of the focus of Operation: Frog *by Scholastic Software, an entertaining introduction to biology.*

"Now Your Commodore 64™ Can Print Like a Pro!"



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The Revolutionary Printer Interface for the Commodore 64™

A New Era in Commodore Printing Power.

Grappler CD offers the first complete answer to your printer interfacing requirements, with many powerful capabilities unique in the Commodore marketplace. Complete signal translation allows many popular name brand printers to operate perfectly with the Commodore 64, or to imitate Commodore's own printer. Even Commodore's graphic character set can be reproduced on Epson, Okidata, Star, ProWriter and other popular printers.

Exclusive Grappler CD features provide a variety of graphic screen dumps, text screen dumps and formatting. No other Commodore interface can offer this.

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If you're serious about quality, trouble free printing... You need the Grappler CD.

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A Uniquely Intelligent Interface:

- Prints Screen Graphics Without Software
- Graphics Screen Dump Routines Include Rotated, Inversed, Enhanced and Double Sized Graphics.
- Full Code Translation From Commodore's PET ASCII to Standard ASCII, the Language of Most Printers.
- Complete Emulation of the Commodore 1525 Printer for printing of Commodore's Special Characters.
- Dip Switch Printer Selection for Epson, Star, Okidata, ProWriter and other popular printers.
- Conversion Mode for Easy Reading of Special Commodore Codes.
- Text Screen Dump and Formatting Commands
- 22 Unique Text and Graphics Commands

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Sunburst Communications, Inc.—"Bright ideas for learning" is the slogan of this New York State-based company which began 12 years ago as a filmstrip publisher and direct mail marketer.

Since entering the educational software field, Sunburst has won awards for its software, and several titles were announced for the 64 at CES. Included were *The Factory* (ages nine to adult), a problem-solving and planning game set in a factory; *The Pond* (ages seven to adult), an experimentation and pattern recognition game; *M-ss-ng L-nks* (ages nine to adult), a reading-writing-spelling game; and *Challenge Math* (ages seven to eleven), a program to help average and slow learners with math facts. (Sunburst Communications, Inc., Pleasantville, NY 10570.)

While space does not permit a listing of all the companies which featured educational software for the Commodore 64, the following companies all had significant products in this area. Many of these companies and their products will be featured in upcoming issues of the GAZETTE. Further information is available directly from the companies:

Alpha Software (Encino, CA), Batteries Included (Costa Mesa, CA), Brøderbund (San Rafael, CA), CBS Software (Greenwich, CT), Commodore Software (West Chester, PA), Creative Software (Sunnyvale, CA), Cymbal Software (Butler, NJ), DesignWare (San Francisco, CA), Diskovery Educational Software (Buffalo, NY), First Star Software (New York, NY), Fisher-Price (Cambridge, MA), Futurehouse (Chapel Hill, NC).

Also, Human Engineered Software (Brisbane, CA), Joyce Hakansson Associates (Berkeley, CA), Krell Software Corporation (Stony Brook, NY), Microlab (Highland Park, IL), Random House Software (New York, NY), Screenplay (Chapel Hill, NC), Sierra (Coarsegold, CA), Simon & Schuster Electronic Publishing Group (New York, NY), Springboard Software (Minneapolis, MN), Timeworks (Deerfield, IL), Weekly Reader [Xerox] (Middletown, CT).

selling for $49.95.

Cymbal, a Canadian software company new to the U.S., introduced two new series for the 64: the Productivity Series (*Tutor Plus*, a typing tutor which offers practice on 50 different business letters, *Data Plus*, a data base, *Calc Plus*, a spreadsheet, and *The Organizer*, a finance and scheduling program integrated with *Calc Plus*); and the Business Series (*General Ledger, Accounts Receivable, Accounts Payable, Inventory Control*, and *Invoice Writer*. Programs in the Productivity Series sell for $39.95 each except for *Calc Plus* ($49.95). Programs from the Business Series are $49.95 each.

Commodore 1541 owners will be interested in *Kwik-Load!* from Datamost. It reprograms the Disk Operating System (DOS) for 300% faster loads and copies, and offers a variety of disk editing features. It retails for $19.95.

There were enough new games announced at CES to cater to nearly every taste—so many, in fact, that space limits even a mention of all of them. Several companies introduced full lines of new arcade software for the 64. Parker Brothers and Sega introduced several translations of popular video arcade games. Brøderbund, Sierra, Epyx, Datasoft, Creative Software, Quicksilva, Datamost, Tri-Micro, and newcomer K-Tel introduced a variety of arcade-style and action/strategy games. Activision, another newcomer to the 64 market, launched six new titles.

Trivia buffs will be interested in several new games, each somewhat different from the others. Screenplay's *The Trivia Arcade* combines fast action, music, and trivia questions. It's for one to four players and sells for $34.95. For $29.95, you can purchase *Question Pack I* to add thousands of new questions. *Trivia Mania* from Professional Software is more straightforward and can accommodate up to eight players. The game also offers a handicapping feature so novices can play with experts. Price is $39.95. Cymbal is offering a whole series—*World Facts, Sports, Entertainment, General*, and *Children's Trivia*—each for $19.95; and for $29.95, *Master Trivia*, which can be used alone or with the previously mentioned specialty games. If you'd rather have a little of each of these categories, there's *Entertainment Tonight* priced at $32.95. Each of these games can be played by up to six players.

HEROES APPLY WITHIN.

QUICKSILVA

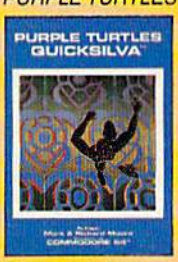
All Titles available from:-

QUICKSILVA INC. 426 West Nakoma San Antonio Texas 78216. (512) 340 3684.

AQUAPLANE

ULTISYNTH

PURPLE TURTLES



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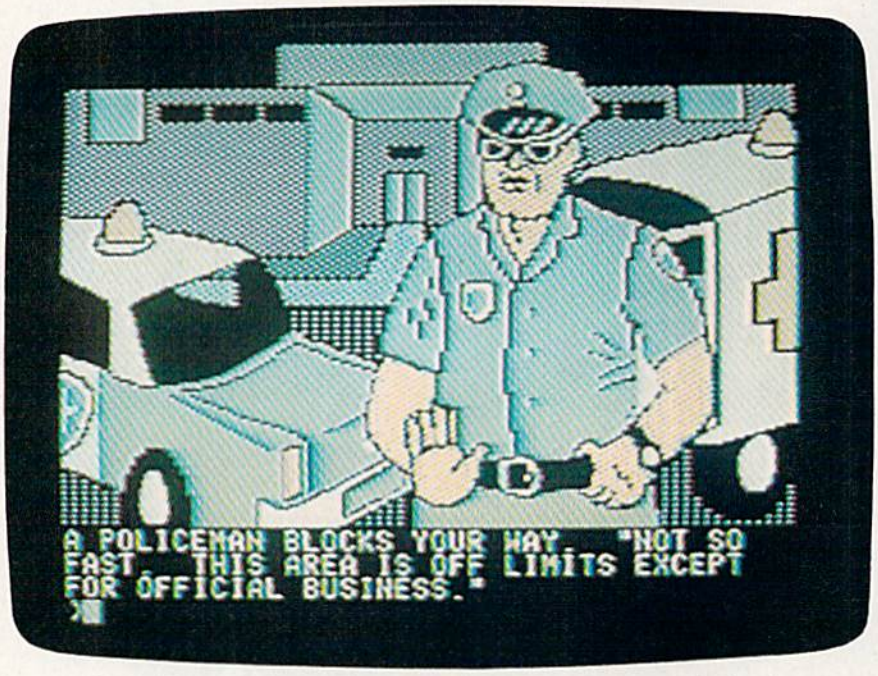
Available on the COMMODORE 64™. Disc or Cassette



Text and graphics combine with an exciting adventure scenario in Amazon *from the new Trillium series.*

The most innovative new "game" concept at CES belongs, perhaps, to Spinnaker's new software divisions, Trillium and Windham Classics. Both of these new product lines are billed as a series of interactive adventures. They're graphics/text adventures, but more than that. Trillium has worked closely with some of the most renowned science fiction authors (Arthur C. Clarke, Ray Bradbury, and Michael Crichton to name a few) to create software versions of their novels. The player enters the scenario of the novel as the protagonist and interacts with the characters and environment. Available titles are *Fahrenheit 451, Rendezvous With Rama, Dragonworld, Amazon,* and *Shadowkeep*. Each package costs $39.95 and includes game background, a

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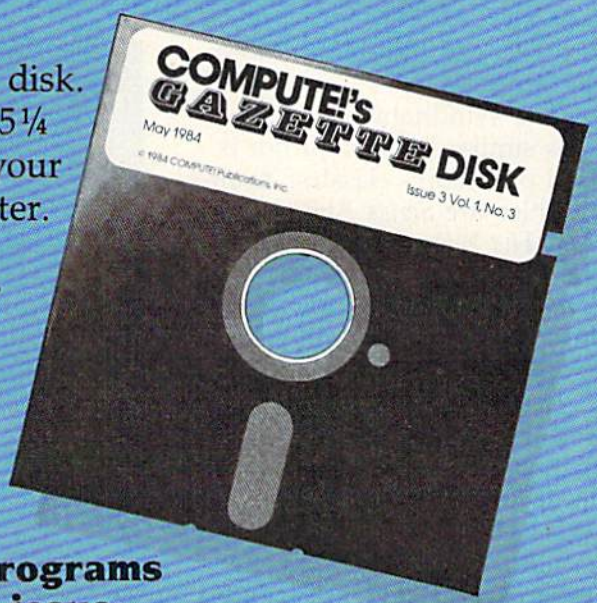

Here are just a few of the quality programs which appeared in the August 1984 issue:

- *Campaign Manager*—A two-player national election simulation written entirely in machine language. Decisions on traveling, campaigning, fundraising, TV appearances, and more determine if your candidate makes it all the way to the White House. For the 64.
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word list, and hint book. More titles are planned.

The Windham Classics Series is similar in concept but is based on literary classics. Available titles are *Swiss Family Robinson, The Wizard of Oz, Gulliver's Travels,* and *Treasure Island.* Designed for ages 10 to adult, each program will sell in the $30 to $40 range.

In the same vein is Infocom's new *Seastalker,* an interactive adventure in the tradition of Jules Verne's *20,000 Leagues Under The Sea,* designed for children 9 and up. But the complexity will appeal to adults, too. It's available for $39.95.

Another interactive adventure series called Time Travelers was introduced by Imagic. *The Time Machine,* based on H.G. Wells' novel, and *Another Bow,* where the player assumes the role of Sherlock Holmes, are scheduled for release in the Fall. Price is not yet determined.

Archon fans will be delighted by the sequel, *Archon II: ADEPT.* Written for Electronic Arts by the Free Fall Associates, authors of the original best-seller, *ADEPT* picks up where *Archon* left off. It's priced at $40.

Access Software's follow-up to *Beachhead* is *Raid Over Moscow,* a multi-scenario action/strategy game where the player must race against the clock to prevent a nuclear holocaust by flying into Russia and dismantling missile launch sites. It's $39.95.

Three new titles from Avalon Hill are *Market Forces,* a world economics strategy game for one to four players ($16 for tape, $21 for disk), *Ripper!,* a

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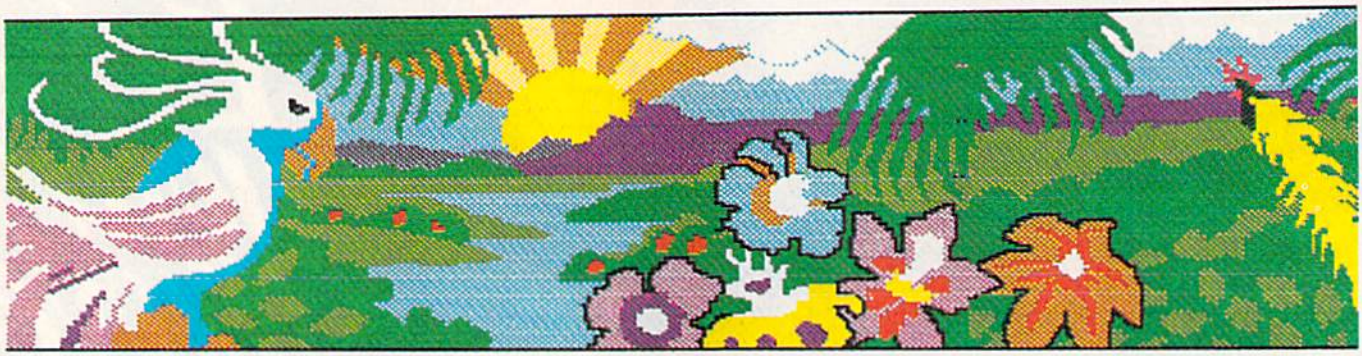

Bright colors and precise resolution are displayed in this printout from the Okimate 10.

mystery adventure based on Jack the Ripper ($25, disk only), and *Panzers East!*, a historical simulation of the 1941 German invasion of Russia ($25 for tape, $30 for disk).

Two new keyboards for the 64 were introduced at CES, and both appear to be exceptional values for the price. The Incredible Musical Keyboard from Sight & Sound overlays the 64's keyboard and is controlled by menu-driven disk-based software. Musical note stickers for each of the keys are included for beginners, as well as a song book and chord book. The keyboard is priced at $39.95. A variety of music software, which can be used with or without the keyboard, is available also. The most impressive of these is the Kawasaki Synthesizer, a double-disk program. This program combines music with beautiful animated graphics. The screen interacts with the music, which can be both enhancing and distracting. The Kawasaki Synthesizer offers 99 preset sounds and a lot of good music with one-key commands. It's $49.95.

The Melodian Keyboard (from Melodian) looks like a portable organ. The 18-inch, 37-key keyboard has a three-octave range. It plugs directly into the 64 and with the appropriate software produces sounds ranging from strings, brass, and woodwinds to synthesizers. Notes are displayed on the screen as they are played. Aimed at the home and school markets, Melodian supports the keyboard with three menu-based software packages, *MelodyMaster, RhythmMaster,* and *ConcertMaster*. The latter is included when you purchase the keyboard. The price is $200.

The most exciting new hardware entry for the 64 at CES had to be Okidata's new dot-matrix color printer, the Okimate 10. It prints text or color graphics at 60 cps, has four character sizes, isn't fussy about the paper it prints on (thermal or plain), and has true lowercase descenders. The Okimate 10 uses a thermal transfer process in which the printhead (a silicon chip with a small heating element embedded) moves across the page, comes in contact with the ribbon, and melts the ink coating off the ribbon onto the paper. It comes with a color and black ribbon cartridge, paper, a connector cable, a Plug 'n Print module (the interface), a manual, and software (designed primarily for those using a printer for the first time). What's even more eye-catching is the price: $239.

Another price breakthrough is Cardco's new monitor tuner, which converts a composite monitor (such as Commodore's 1701/1702) into a TV. Cardco has two versions, the MT/1 and the MT/2, for $199.95 and $99.95, respectively. The MT/1 is a remote control, 60-channel cable ready tuner which features a digital readout for precise tuning and separate audio and video output. The MT/2 has a UHF/VHF dial on the front of the tuner and a cable/antenna input. Both tuners have computer/TV switches and can be used with color or monochrome monitors.

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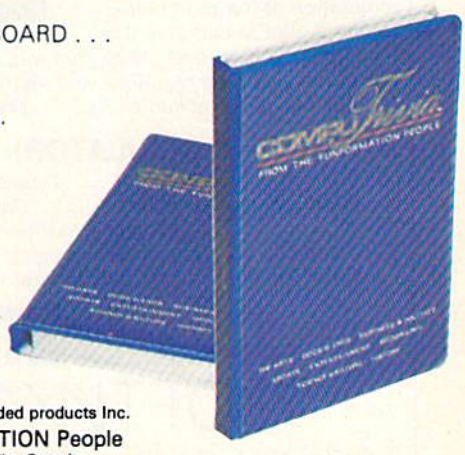

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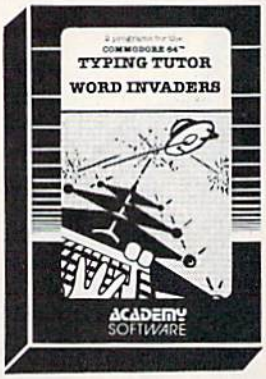

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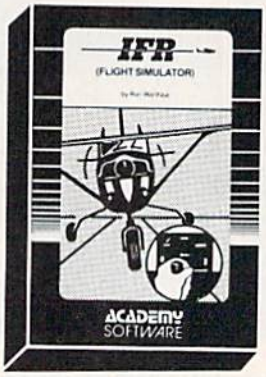

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With new products continuing to support the 64, it's hard to imagine a machine this popular becoming obsolete. Yet because the industry is so new and has gone through some drastic changes, it's easy to wonder about the future of the 64. Eventually, it *will* follow the VIC out the back door. A hint of what's to come was in the wind at CES.

Sinclair's new 16/32-bit computer, the QL, uses a 68008 microprocessor (virtually the same chip as found in Apple's Macintosh) and offers 128K RAM expandable to 640K. It comes with a built-in word processor, spreadsheet, data base manager, and graphics package, two built-in 100K "microdrives," (high speed endless-loop tape drives) and two RS-232C interfaces. Its 32K ROM operating system allows for multitasking—the ability to run several programs individually and simultaneously. The QL ("Quantum Leap") weighs three pounds and will be available this Fall for $499, mail order only. The question of software support for this powerful, new machine from England remains, but it clearly demonstrates what kind of power the next generation of computers will offer at a reasonable price.

On the other side of the globe, in Japan, another kind of computer is gaining fast—those conforming to the MSX standard. MSX is an internal hardware architecture standard developed by Microsoft, and Japanese/ Korean computers adopting it will probably hit the U.S. market sometime in 1985. The potential marketing strength of the MSX, built around the eight-bit Z-80 processor, is that companies can license the architecture, house it in their own keyboard, and thus create a computer which is hardware- and software-compatible with any other MSX computer. Any software written for, say, a Panasonic MSX computer runs fine on a JVC or Spectravideo MSX machine. If Microsoft is successful in establishing the MSX as an industry standard, we could see a massive wave of change in the home computer market. But, for now, enjoy the feast.

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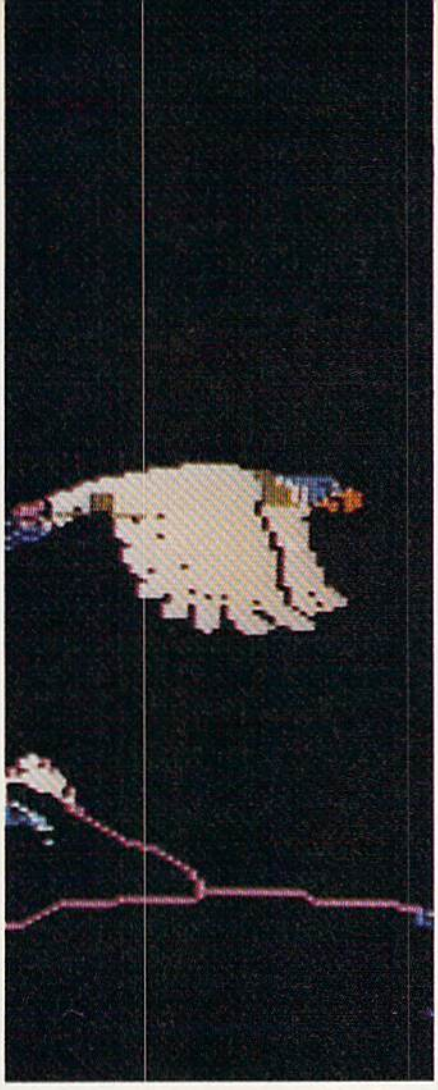
The Designers Behind *MovieMaker*

Kathy Yakal, Editorial Assistant

Guy Nouri and Eric Podeitz (second and third from left, second row back) and other staff members of Interactive Picture Systems.

Electronic construction sets—programs which allow non-programmers to design games or programs—are finding their niche in the software market. Bill Budge pioneered this new genre with *Pinball Construction Set*. Now there's *MovieMaker*, recently released by Reston Publishing for the Commodore 64, which turns your computer into an animation studio.



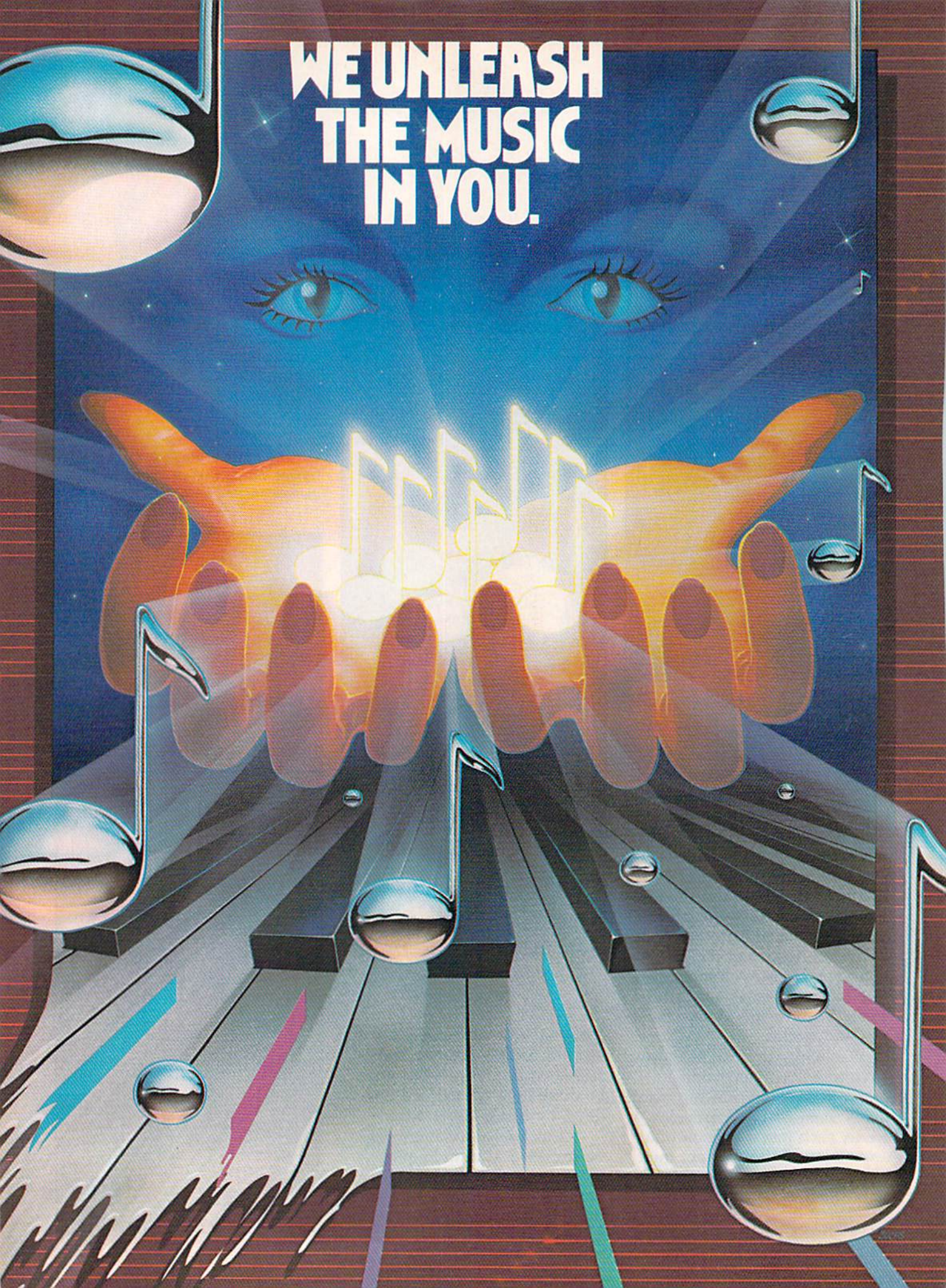
Coming in for a landing: these three frames are part of an animated sequence created with MovieMaker.

About the time that the early filmmakers were struggling to combine sound and moving pictures, a young man named Walt Disney—using techniques that had been discovered in the mid-nineteenth century—began producing animated cartoons. Free of the restrictions of reality that bound and frustrated motion picture makers, Disney sought to create his own imaginary characters and worlds.

Creating cartoons in those days was slow, painstaking work. It involved drawing many, many versions of a particular scene, each just a fraction of a second later in the action, then "flipping" them very rapidly to offer the illusion of motion.

What used to take professional animators weeks, even months to do—create a short, animated sequence—can now be done by a novice in a few days, by using *MovieMaker*.

This package cannot truly be regarded as a traditional videogame. Guy Nouri, president and co-founder of Interactive Picture Systems, says it was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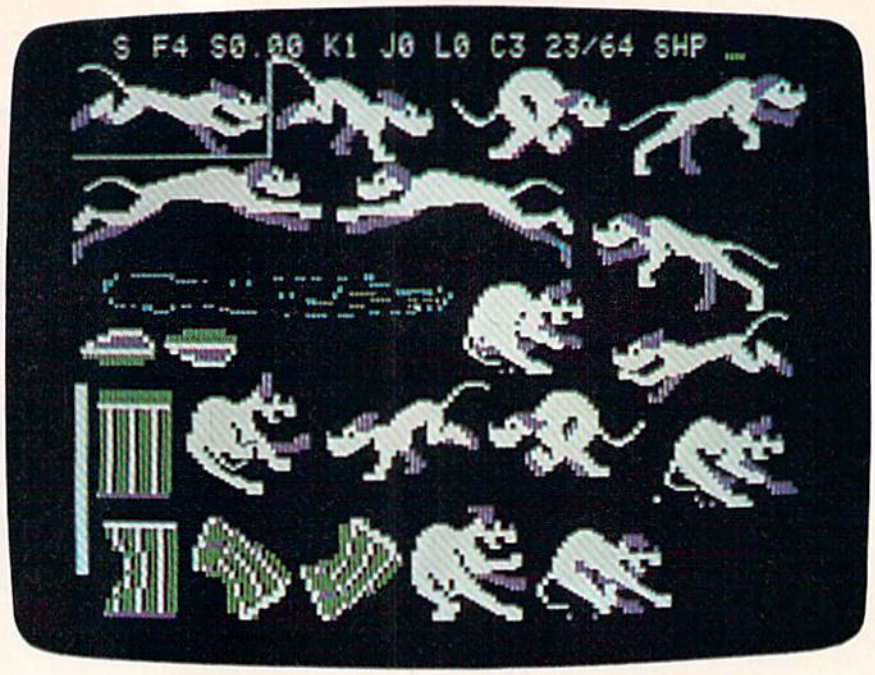

You can create your own shapes for animated sequences in MovieMaker, or choose from pre-defined shapes, like this page of dogs.

written for artists and animators, people who need to make graphics move.

At that, it's been successful. Local 841 of the Screen Cartoonists Union in New York City tested it for six months and gave it their seal of approval.

But it's also been recognized as having a great deal of appeal for the artistic community. It's been exhibited at a number of museums, including the Beaubourg in Paris, the Exploratorium in San Francisco, and the Corcoran Art Gallery in Washington, D.C. Several East Coast educational institutions have incorporated it into parts of curricula or special projects. Other software designers are using it to design superior animation in their programs.

But perhaps most important to Nouri, it's for those "who want to create their own stories, their own computer movies."

Interested? You'll need to spend about a week with *MovieMaker* to grasp all of its capabilities, but you can get started in five minutes, and create a short animated sequence in less than a day.

You'll go through all the steps that a real filmmaker or animator would go through in creating a short film, only you make all the decisions yourself.

By communicating with the program through the joystick and keyboard, you'll create your cast (either by selecting predefined people and animals, or drawing your own), draw in scenery and add color, and arrange your shapes into the sequence that will be your story.

Next, add sound, titles, and any other special effects you want. Record the whole sequence. Now go back and edit your movie. And play it.

How many times have you sat through all of the credits at the end of a movie? Probably not many. Most of us brush the popcorn off our laps and head out, not particularly caring who the gaffer and best boy were.

Making a major motion picture these days can take hundreds of crew members, millions of dollars, and many months, even years.

But in their early days, movies didn't require more than a few people. One of the very first films made was a few seconds long and consisted of a man sneezing. The crew was the cameraman and the guy who sneezed.

Movies have evolved, but the microcomputer industry is still in its infancy. And most videogames of the last decade have been written by one person, sometimes involving input by a few others. But production of tomorrow's videogames will involve a level of complexity close to that of film production, Guy Nouri believes. Hence, his company, Interactive Picture Systems.

Guy Nouri was born in Alpine, New Jersey. He attended a number of different schools, including St. Paul's School and Princeton University, studying fine arts, art history, film, photography, and computer graphics.

After two years at Princeton, Guy walked into his advisor's office for some class scheduling. He recalls: "My advisor looked at my records and said, 'You've already completed all your fine arts requirements, but you haven't taken any French or history or anything like that.'

"That's right," Nouri replied. So he packed up and left.

Nouri spent the next few years on the West Coast, working as an electrician to support himself while he continued painting and sculpting. His interest in microcomputers, piqued partly by what he saw going on at Xerox PARC (Palo Alto

Flight Simulator II

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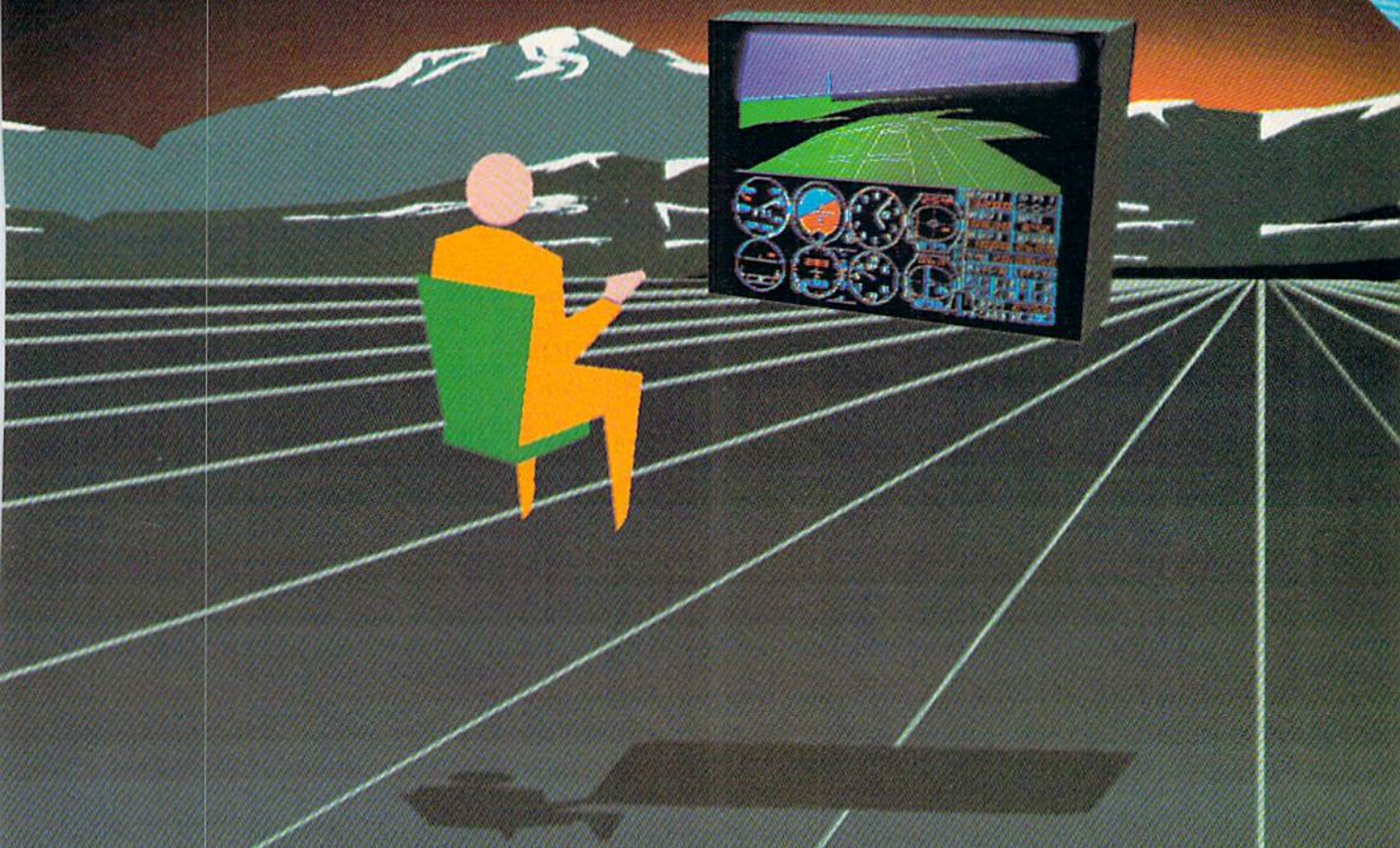

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Research Center) in the early 70s, led him to start a magazine, *Computer Pictures*, in 1980.

It was about that time that Nouri met Eric Podietz, who had been programming computers since he was a teenager at the University of Pennsylvania. Podietz had formed his own graphics software company and created a package called *Painter Power*.

The two joined forces on a graphics program called *Paint* (originally programmed on a mini-computer by Dick Shoup) for the Capitol Children's Museum in Washington, D.C. The program was a hit, and a partnership was born: Interactive Picture Systems incorporated in 1982, and Nouri and Podietz moved on to their next project.

"We had done *Paint*. The next step was to make it move, to animate it," says Nouri.

IPS approached a publisher with their idea, and were politely told that was impossible. "You could barely get a paint program," they were told.

"Trust us," they replied.

"OK, show us some samples," the publisher countered.

So Nouri and Podietz showed them three animated frames.

"Keep trying," said the publisher.

Two months later, IPS had a ten-frame animated sequence that would continue to loop without bombing.

And they had a contract.

MovieMaker took five people two years to complete. The original cost estimate was $60,000, but the final expense went over $200,000. "It was a labor of love," says Nouri.

The roles of a movie crew are pretty well defined, and familiar to anyone who watches movies. You've got actors, directors, producers, writers, editors, and a number of other technical and creative roles.

Software design groups are not yet so compartmentalized. At Interactive Picture Systems, though, roles are evolving.

There were basically five people involved in the design and production of *MovieMaker*: Guy Nouri, Eric Podietz, Jimmy Snyder, Mark Scott, and Bob Svihovec.

In creating *MovieMaker* Nouri and Podietz were responsible for the overall project, as well as many of the intricate details. Nouri describes Podietz as the partner that sees things on the inside, and himself as the one who sees them on the outside.

This means Podietz concerns himself more with the actual task of programming. "Eric builds the program from the inside out," says Nouri. "He decides what has to be done to set up the program, how the code has to be set up, where these newfangled data structures will go."

Nouri, on the other hand, must constantly assess what he calls the *psychological interface*. "I look at things like user experiences and the marketplace," he says. "That means looking at how someone feels as they approach the software, what their expectations are, what they want to do, how they want to feel while they're doing it. There's also a lot of care taken to the subject matter itself."

Nouri and Podietz communicate in a kind of "metalanguage," one which can best be described as a way of talking about states. What state is the program in? What state is the user in? You have to link those up. "An awful lot of attention and time is given to getting the dialogue between the program and player right," says Nouri.

So how does this partnership work, with its varying areas of emphasis and its unique form of communication? "We argue all the way down the line," Nouri chuckles.

"Software engineers" Jimmy Snyder and Mark Scott were also key to the development of *MovieMaker*. "Jimmy is what we call a black box maker," says Nouri. "He can write these outrageous little algorithms, these routines that make things just zip across the screen."

Mark's imagination and programming skills were a major contributing factor to the user-friendliness of the program. And Bob Svihovec, now art director at IPS, did the animation.

Over the last two years, IPS has grown to a staff of 20 software engineers, graphic artists, and various support people. Their business office is a couple of rooms on Park Avenue in New York City, and their creative work is done in seven rooms on four floors of a brownstone in Philadelphia.

Nouri believes strongly in treating each of those 20 staff members as unique, creative individuals. The result, he says, is a commitment from those people unattainable in any other way.

That commitment has contributed to the development of a

prolific crew of software designers. Besides *Paint* and *MovieMaker* (published by Reston Publishing), IPS has done an aerobics simulation for Spinnaker Software, and *Operation Frog*, a simulation of a frog dissection for Scholastic. They've recently signed a contract with Electronic Arts for a game that is "...more fun than a comic book," according to Nouri.

"Publishers are starting to come to us and ask us what we want to do," which Nouri believes is the way it should be. "I think what we're going to see is a lot of banding together of artists over the next few years," he says.

Nouri likens the major software developers over the next few years to professional sports teams. "I think it's a lot more like that than book authors or rock and roll stars," he says.

"There may be a few stars. And there will probably be a kind of major league, a dozen or so famous teams of software designers," he says. "I also don't think there will be more than a dozen or so software publishing houses, probably grouped by personality of the software, like business or entertainment."

If Nouri wants to be the Babe Ruth of the software league, it's not obvious. He's humble. He's eager to listen to the ideas of others. He continues to hone his own artistic skills, and broaden his understanding of how humans can effectively communicate with computers, and with other people through computers.

And he's quick to share the credit for IPS' success with all the other members of the team, and to praise the important contribution of sensitive publishers. "Publishers would do well not to treat software development like manufacturing, because it ain't," he says. "It involves talent, and it involves creative, temperamental, sensitive people. There's a real balance to maintain."

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80 Columns For The 64

Gregg Peele, Assistant Programming Supervisor,
And Kevin Martin, Editorial Programmer

Did you ever wish for an 80-column screen? "Screen-80" transforms your 64 into an 80-column machine without affecting the normal screen editing keys. We've also included "Custom-80," which allows you to create your own 80-column character set with a joystick.

"Screen-80" offers a full 80-column screen and provides you the ability to use your 64 to write, edit, and even run BASIC programs (including some commercial software). You can also use all the cursor controls of the normal screen editor. It runs concurrently with the normal system, allowing a quick switch between 40- and 80-column modes.

Best of all, little memory is used by Screen-80. The program consists of approximately 3K of machine language which goes into RAM "underneath" ROM. There are also 43 bytes which are placed in a little used area of RAM (locations 710–753). Since the bulk of Screen-80 uses the same memory locations as the operating system, and the location of the 43 bytes used from RAM are normally unused anyway, Screen-80 works without any apparent loss of programming space.

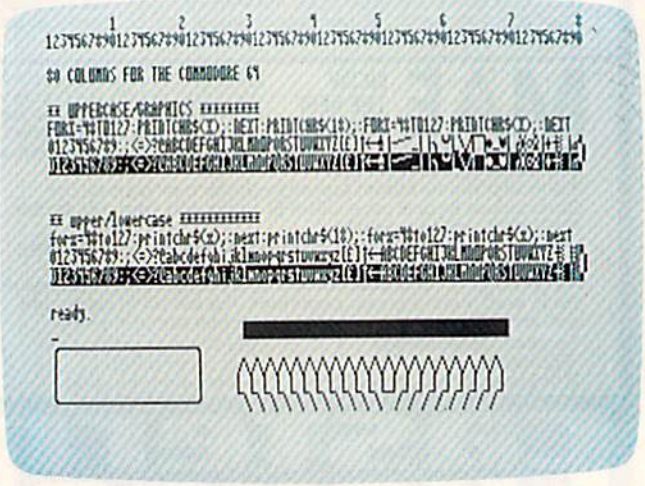
Using 80 Columns

Once you enter 80-column mode, the first thing you're likely to notice is the smaller size characters. Since increasing the size of the screen is impossible, adding 40 more columns to the 64 makes it necessary to halve the size of each character. Some televisions may not produce a clear enough picture to make these smaller characters readable, so you may find it difficult to read text in 80 columns. We recommend using a video monitor with the color turned off. You may want to change the character set to suit your personal taste or needs. "Custom-80" (discussed later) is designed to let you do just that.

Screen-80 provides a different cursor than does the normal 40-column mode. Rather than a blinking block, it uses an underline character; but like the normal cursor, it can move anywhere on the screen. In fact, you can use all the cursor control keys, just as you would normally, to insert or delete, home the cursor, clear the screen, or create BASIC program lines.

Both uppercase/graphics and lower/uppercase modes are supported in Screen-80, but you cannot toggle between these modes with the SHIFT-Commodore key combination. Instead, you can put the screen editor in lower-/uppercase mode by pressing the CTRL and N keys simultaneously, or by printing CHR$(14). To return to uppercase/graphics mode, simply print CHR$(142) to the screen. These methods affect only characters printed after these commands. Thus, you may have both sets (for example, graphics and lowercase) on the screen at the same time for increased programming flexibility.

You can change the color of the background, text, or border by simply POKEing the appropriate color number into location 53281 (for the background), location 646 (for text), or location 53280 (for the border). Changing text color changes the color of all text on the screen. If you want to change the background or text color during program mode, print a CHR$(13) after POKEing the appropriate location. Since color memory is fixed on the 64, it's impossible to have true 80-column color. Therefore, Screen-80 does not recognize color codes in PRINT state-



Graphics, upper- and lowercase can be displayed simultaneously with Screen-80.

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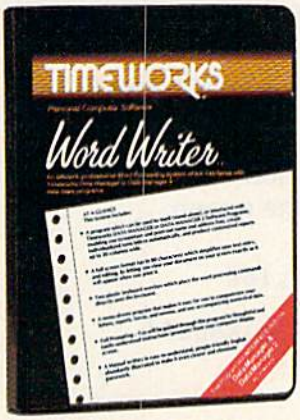

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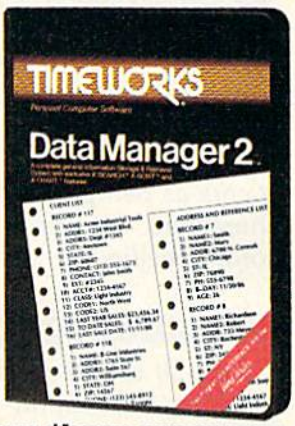

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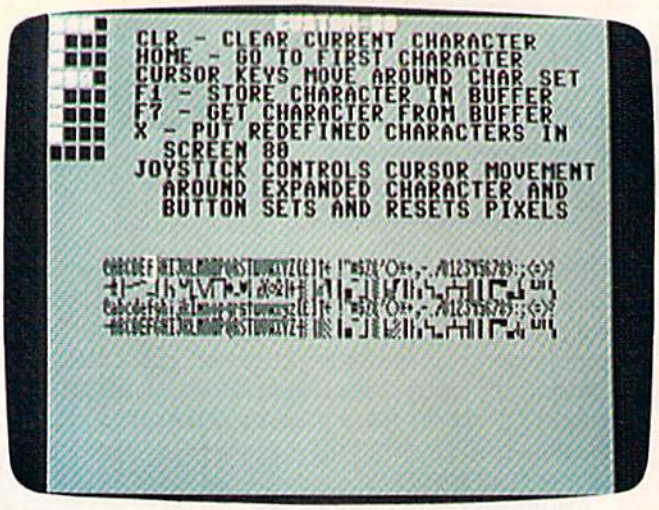
CLR - CLEAR CURRENT CHARACTER
HOME - GO TO FIRST CHARACTER
CURSOR KEYS MOVE AROUND CHAR SET
F1 - STORE CHARACTER IN BUFFER
F7 - GET CHARACTER FROM BUFFER
X - PUT REDEFINED CHARACTERS IN
SCREEN 80
JOYSTICK CONTROLS CURSOR MOVEMENT
AROUND EXPANDED CHARACTER AND
BUTTON SETS AND RESETS PIXELS

Redefining characters is easy with Custom-80.

ments as being any different from other graphics characters. All printing to the screen uses the color specified in location 646.

Graphics And Sound Routines

Screen-80 can be used with sprites, high-resolution graphics, and sound—just like the normal 64 screen. Since this program actually uses a hi-res screen, you can also use it for other graphics displays. You can even have text and hi-res graphics on the screen at the same time. (Check your *Programmer's Reference Guide* for more detailed information on how to plot points on the hi-res screen.)

To plot points (or do anything else) to the hi-res screen, it is important to know how to POKE and PEEK to the screen. The hi-res screen for Screen-80 is located at 57344 ($E000). Since this screen memory shares addresses with ROM, you may POKE graphics safely to the screen, but attempting to PEEK from the screen will give you values from the ROMs. To PEEK these screen locations, you must first disable interrupts, then use location 1 to reconfigure the 64. Location 1 allows you to selectively replace ROM locations with RAM—making it possible to have a full 64K of RAM on the 64. Once you reconfigure the 64, you can PEEK locations on the screen. Since the operating system must access the ROMs to function properly, you must immediately restore the 64 to its normal configuration and re-enable interrupts. Here's an example of how to do it in BASIC:

```
10 POKE 56334,PEEK(56334)AND254:REM DISAB
   LE INTERRUPTS
20 POKE 1,53:REM RECONFIGURE 64
30 PRINT PEEK(57344): REM PEEK THE FIRST
   {SPACE}BYTE OF SCREEN RAM
40 POKE 1,55:REM RETURN 64 TO NORMAL
50 POKE 56334,PEEK(56334)OR1:REM REENABLE
   INTERRUPTS
```

Using sprites in Screen-80 requires all sprite data to be kept within the same 16K block as the hi-res screen. Locations 49152 ($C000) to 53247 ($CFFF) are perfect places to put sprite data. The sprite pointers for Screen-80 are located at 53248+2040 to 53248+2047. To cause sprite 0 to get its data from 49152 ($C000), put a zero into location 53248+2040. Since POKEs to this area of memory are normally intercepted by the I/O chip, we must disable interrupts and I/O to put a value into these locations. Here's a program to put a sprite onto the screen:

```
10 V = 53248
20 POKE V,100:POKE V+1,100
30 POKE V+39,2
40 POKE 56334,PEEK(56334)AND254
50 POKE 1,PEEK(1)AND251
60 POKE 53248+2040,0
70 POKE 1,PEEK(1)OR4
80 POKE 56334,PEEK(56334)OR1
90 POKE V+21,1
```

Creating sound from within Screen-80 is done exactly the same way as from the normal screen. In fact, since you want to POKE the information to the SID chip (in the I/O area), you don't have to disable interrupts or do any bank switching, as was necessary for hi-res graphics or sprites. The normal POKEs will do.

Using Other Programs With Screen-80

This program is designed to intercept any calls to the normal Kernal PRINT routine ($FFD2). Software which bypasses this routine or POKEs directly to the screen will not work correctly with Screen-80. An example of a program which bypasses the PRINT vector is the DOS wedge program (on the TEST/DEMO disk which comes with 1541 disk drives). Fortunately, this problem can easily be fixed by changing all PRINTs to pass through the standard vector. This program, when used in place of the normal DOS boot program ("C-64 Wedge"), changes these references.

```
10 IF A=0THENA=1:LOAD"DOS 5.1",8,1
20 FORI=1TO7 : READ A:POKEA,210: POKE A+1
   ,255:NEXT
30 DATA 52644,52650,52712,52726,52752,527
   65,53075
40 SYS 52224
```

With these changes, the DOS support program will work with Screen-80.

One of the best applications of Screen-80 is with terminal software. We tested Screen-80 with the terminal software that comes with the VICmodem and the 1650 Automodem by Commodore. Since both programs use the standard

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PRINT vector, they work fine. Programs which depend on sprites should be avoided, as should programs which move screen memory or otherwise change the normal configuration of the 64.

SpeedScript does not use the PRINT vector at $FFD2 to update the screen, which makes it incompatible with Screen-80.

How To Enter And Use Screen-80

Like most machine language programs in COMPUTE!'s GAZETTE, Screen-80 is listed in MLX format. That means you must first type in the MLX program and then use it to enter Screen-80. The newest version of MLX has a built-in numeric keypad to ease the burden of typing all those numbers (see the MLX article for details). Initially, Screen-80 resides in the same area as the beginning of BASIC. To protect MLX from being overwritten by Screen-80, we'll use a starting address of 49152 and an ending address of 52811. Once you've entered the program and saved it to tape or disk, turn your computer off and then on again.

Now LOAD the program from disk or tape using the normal format for LOADing BASIC programs:

LOAD *"filename"*,**8** (for disk)
LOAD *"filename"* (for tape)

Notice that we LOADed our program without the ,1 that generally accompanies ML programs. If the program loaded correctly, you can LIST it. You should see one line with a SYS command. Simply RUN the program and you'll have Screen-80. Pressing RUN/STOP–RESTORE will put you into 40-column mode, and typing SYS710 and pressing RETURN will bring back 80 columns. You can make a backup copy by simply saving it as you would a BASIC program:

SAVE *"filename"*,**8** (for disk)
SAVE *"filename"* (for tape)

At this point, type NEW to begin programming in 80 columns.

Custom-80: Creating Your Own Character Set

"Custom-80" (Program 2) allows you to create your own character set for use with Screen-80. It's easy to use and requires a joystick. Custom-80 "borrows" the character set from Screen-80 and then moves it to a safe location in memory for editing. After editing, you can return the custom characters to the Screen-80 program, or save your new character set to disk or tape. Like Screen-80, it's in MLX format. The starting address is 49152 and the ending address is 51240. To load Custom-80, type:

LOAD"CUSTOM-80",8,1 (for disk)
LOAD"CUSTOM-80",1,1 (for tape)

After loading it into memory, type NEW to reset the BASIC pointers. Next, LOAD Screen-80 into memory and SYS 49152. This puts you in Custom-80 and, at the same time, accesses the character set included with Screen-80.

The Screen-80 character set is displayed in the lower half of the screen, while the current character being edited is framed by a yellow cursor. In the upper-left corner of the screen the character is enlarged for editing, and brief instructions are provided to the right.

Customizing Characters

You can choose which character you want to edit by moving the cursor around the screen using the joystick or the cursor keys. The flashing blue square indicates the current pixel in the character you are editing. To set the pixel, press the fire button on the joystick. To reset the pixel, press the fire button again.

Press SHIFT and CLR/HOME to clear all the pixels in the character you're editing. (This will not affect the characters previously edited.) To home the cursor to the first character, press CLR/HOME without pressing SHIFT. To copy a character from one position to another, press f1 to store the current character into the buffer. Then move the cursor to the new position of the character and press f7 to retrieve it from the buffer.

Pressing S saves the character set to tape or disk as a short program file. It can then be loaded back into memory with the L command. When loading or saving, you will first be asked for the name of the file, then asked to press T for tape or D for Disk. If an error occurs during a

```
751 for j=0to7:pokes+j,0:next:pokes+24,15
757 for j=1to2500:next
760 ifi=0then772
763 i=3:print"Your solution is correct!":gosub1710
769 print"Player #";q"has cracked the case!":goto782
772 i=2:print"No!...That was a false arrest!":gosub1710
775 gosub1000:pz(25+q)=0:pz(50)=pz(50)+1:print"You're out of the game!"
778 ifpz(50)>pz(20)then750
781 restore:gosub1713:forj=1to500:next:gosub1713
787 print"All players have given incorrect":print"solutions to the crime!!"
795 print"Nobody wins !"
797 print"Here is the correct solution:":print"The "s$(pz(32))
799 print"killed the "s$(pz(35)):print"in the "r$(abs(pz(37)))","
791 print"using the "s$(pz(33)+10)".":end
800 print"   ### INSERT AN ITEM ###":gosub1000
813 ifi=0thenprint"You weren't carrying anything !":goto750
806 print"You drop ";:gosub1200:print".":goto750
820 print"   ### TAKE AN ITEM ###":j=1:print"These items are available:"
823 fori=11to31:ifpz(i)<>0then829
826 printj;" ";:gosub1200:print".":poke900+j,i:j=j+1
829 next:ifj=1thenprint"No items.":goto750
832 print"Enter number to take an item, or":print"enter zero to take nothing."
break
ready.
```

Programming in BASIC with 80 columns.

disk operation, the program will return with the error message.

If you wish to make the new character set a permanent part of Screen-80, press X. This puts the redefined character set back into Screen-80 and exits to BASIC. You can then save the new version of Screen-80 to disk with the redefined characters already in the program by entering:

```
SAVE"SCREEN-80",1  (for tape)
SAVE"SCREEN-80",8  (for disk)
```

The next time you run Screen-80, you'll have your new character set in the program.

If you wish to use various character sets with Screen-80, you should save the character sets to tape or disk using the method just discussed and load the individual character sets by using Program 3 while in Screen-80. This program LOADs the new character set into Screen-80 *after* it is activated. When the program prompts you for the name of the character set you want to load, enter the filename, comma, and the number of the device you want to LOAD the character set from. Use 8 for disk, 1 for tape.

One important note: You cannot SYS to Custom-80 from Screen-80. You must press RUN/STOP–RESTORE to leave Screen-80 before typing SYS 49152 to run Custom-80.

How It Works

First, Custom-80 performs a block memory move of the character set data from Screen-80 to 12288 ($3000). This is done to make it easier to display the character set at the bottom of the screen.

Next, a raster interrupt splits the screen to show both the redefined character set and the normal character set. The instructions and the enlarged character are printed on the top half of the screen. The enlarged character is a 4 × 8 matrix of reverse SHIFT-Os. Before entering the main loop, all variables are initialized.

The main loop has two major routines. The first routine checks the joystick and keyboard. If a key is pressed, the appropriate flag is set. Pressing X sends the program to the routine that moves the character set back into Screen-80. The S key saves a character set, while the L key loads a character set.

The second routine prints the enlarged character on the screen. If any flags were set, this routine handles them. It takes care of the save-to-buffer routine, the get-from-buffer routine, the clear-character routine, and the routine that handles the flashing of the blue cursor in the enlarged character.

See program listings on page 158.

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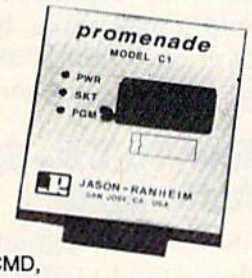

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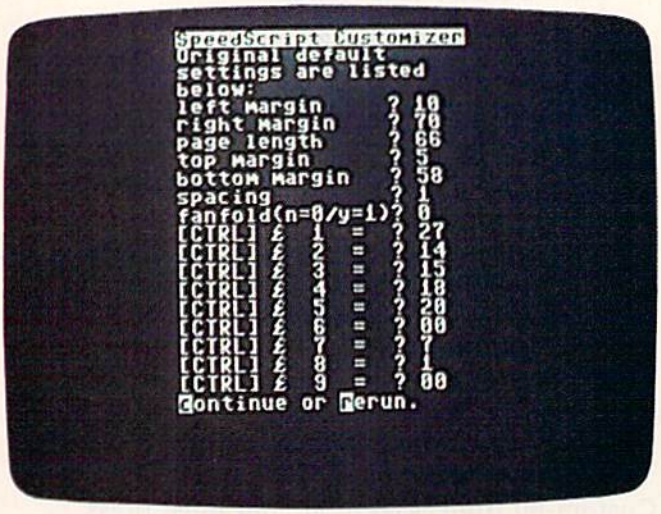
SpeedScript Customizer

J. Blake Lambert, Assistant Editor

When "SpeedScript" was first published, we didn't imagine how popular it would become with GAZETTE readers. One of the most frequently asked questions is how to change the default settings and formatting commands to suit individual preferences. This short program is the solution. It modifies SpeedScript with values you choose, creating a new version which can be saved to tape or disk. For the VIC (with at least 8K expansion) and the 64.


SpeedScript Customizer
Original default
settings are listed
below:
left margin ? 10
right margin ? 70
page length ? 66
top margin ? 5
bottom margin ? 58
spacing ? 1
fanfold(n=0/y=1)? 0
[CTRL] £ 1 = ? 27
[CTRL] £ 2 = ? 14
[CTRL] £ 3 = ? 15
[CTRL] £ 4 = ? 18
[CTRL] £ 5 = ? 20
[CTRL] £ 6 = ? 00
[CTRL] £ 7 = ? 7
[CTRL] £ 8 = ? 1
[CTRL] £ 9 = ? 00
Continue or Rerun.

SpeedScript Customizer allows you to set your own values for margins, spacing, paper style, and printer codes.

If you use either version of SpeedScript with a VIC or 64, tape or disk, this customizer program will be a real timesaver. It allows you to predefine background and character color, left, right, top, and bottom margins, page length, line spacing, and to select single sheet or fanfold (continuous pinfeed) paper. In addition, you can change or add values for the predefined formatting codes used for printing.

"SpeedScript Customizer" fixes the new page command in SpeedScript 1.0 (January) for the 64, and corrects an error in the predefined values of the version printed in *COMPUTE!s Second Book of 64*.

In short, you can make your own personalized copies of SpeedScript with any values you choose. The Customizer doesn't *improve* SpeedScript; it lets you teach SpeedScript to do things your way (until it is otherwise notified). Once you've used SpeedScript enough to know what values you prefer, you're ready to use the Customizer.

For example, you may prefer to print documents single spaced with margins at 10 and 70, using single sheets of paper. You may also need to be able to send special codes to the printer to access all of its features, such as emphasized characters, underlining, special symbols, etc. SpeedScript allows you to assign formatting codes at the beginning of a document, but you have to define them every time you want to use them.

It's possible to set up format files and SAVE them if you like, but it's simpler to use the Customizer to SAVE your personalized version(s) of the program instead. The values can still be redefined in the same way as before; we're just changing the default values, what SpeedScript thinks is "normal." It doesn't destroy the original, it just creates new, personalized copies. You could, for example, have one version of SpeedScript for writing business letters, one for personal letters, and another for writing reports.

How To Use SpeedScript Customizer

First type in Programs 1 and 2, and SAVE them. (Make sure to name Program 2 "CUST.SS" so that it will load properly.) Next, LOAD and RUN Program 1, the Customizer Boot. This automatically loads and runs Program 2. The Customizer will prompt you to insert the version of SpeedScript written for your computer, then ask for a filename. Enter the filename of the SpeedScript version on your tape or disk and press RETURN. Press d for disk or t for tape at the prompt, and as soon as it finishes loading, the Customizer will display which version it has found. (For example, VIC SpeedScript v1 means you're using a VIC and the SpeedScript published in the January 1984 issue.) This message is then followed by the color selection screen.

Not all monitors have perfect picture resolution, and many of us use a TV for a computer monitor. So, it's nice to be able to select the color

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of the background and characters, which SpeedScript allows with the CTRL-b and CTRL-l commands. But if you CLEAR ALL TEXT, the program returns to the default colors (the colors that were there when you first ran the program). The color selection screen in the Customizer allows you to flip through the background colors with the f1 key and through the character colors with the f3 key. Some people like to use a dark gray or black background with light green characters, to emulate a green screen monitor. When you find a combination that suits you, press RETURN.

Changing The Default Values

After you've set the letter and background colors, another menu appears. The program will ask you to enter a series of values for the default values. If you choose not to change a setting, simply press RETURN and the original default will remain unaltered. Here are a few tips on setting the values correctly:

- Left margin: Sets the default value for the [l] function (obtained by holding down the CTRL key and pressing the £ key, then pressing l) in SpeedScript. As on a typewriter, the left margin is the distance (number of spaces) from the left edge of the page before characters are printed. It should be at least 1. For a one inch margin with normal (pica, ten characters per inch) type, set this value to 10. With other print sizes, multiply the margin width you want (in inches) by the number of characters per inch.
- Right margin: Sets the default value for the [r] function. This is the preferred distance from the last character on a line to the right edge of the paper, subtracted from the number 80. You can also think of this as the left margin plus the number of characters per line you want to print. With 8½ inch wide paper and [l] set at 10, make [r] 70 for a one-inch right margin.
- Page length: This value has no corresponding function in SpeedScript. It is the number of lines that fit on a page, preset at 66, since standard paper is 11 inches long and most printers print six lines per inch. If you want to use personalized (nonstandard) stationery or legal-size paper, you would change the value accordingly (inches of length times six). Also, some printers or interfaces allow you to change the spacing between lines to print eight lines per inch on standard paper. Once you've set the printer into this mode (you may have to flip a switch on the interface or send a special code to the printer), change the page length value in SpeedScript to 88 (lines per inch times length of paper in inches). Remember to change the bottom margin, too.
- Top margin: Sets the default for [t]. This is the number of blank lines at the top of the page. Should be 5 or more.
- Bottom margin: Sets the [b] default. This is the page length minus the number of lines you would like at the bottom of the page. You can think of this as the top margin added to the number of lines you want to print. Should be 58 or less when using standard paper, and always at least 8 less than the page length.
- Spacing: SpeedScript's [s] function. Use a 1 for single spacing between lines of text, a 2 for double spacing, and so forth.
- Paper style selection: Works like the [w] command. Answer 0 and SpeedScript will wait for you to press RETURN after printing each page of text. Allows you to use single sheets of paper more easily. The default value, 1, signals continuous pinfeed paper, but you can still use the [w] command when you wish.

The user-definable reverse video numbers can also be preset in this section of the program. The first four of these probably should not be redefined. If you often share files with friends, you should consider standardizing your use of predefined numbers. (See below for tips on setting the user-definable codes.)

After setting the values, the program will ask if you wish to continue or rerun. Check the values and press r if you find any errors (the program will start over from the beginning). Otherwise, press C to continue, then enter the filename you want to use for your new customized version of SpeedScript and press RETURN.

Make sure to give the new SpeedScript a unique name so that when you have several copies saved you'll know which one to load. (SpeedScript Customizer doesn't allow the SAVE with replace option, so you can't destroy the original SpeedScript while using the Customizer.) Remember that no matter what version you use, the default values can still be changed using the CTRL-£ commands in SpeedScript.

When the program finishes, it resets the BASIC pointers and saves your modified SpeedScript. If all goes well, the program will automatically RUN your new version. Disk users should check the error channel by pressing the up-arrow key while holding down CTRL, then pressing RETURN. Next, look at the directory using SpeedScript's CTRL-4 command. Tape users can recover from errors (for example, if RECORD was not down during the SAVE) by pressing RUN/STOP–RESTORE, then typing SAVE "new filename",1 followed by RETURN. If the program does not execute properly, remember to turn the computer off, then on again

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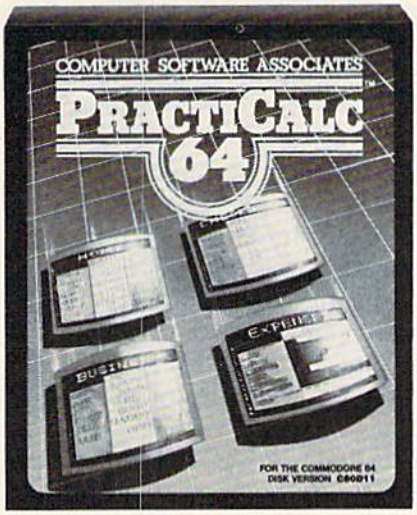

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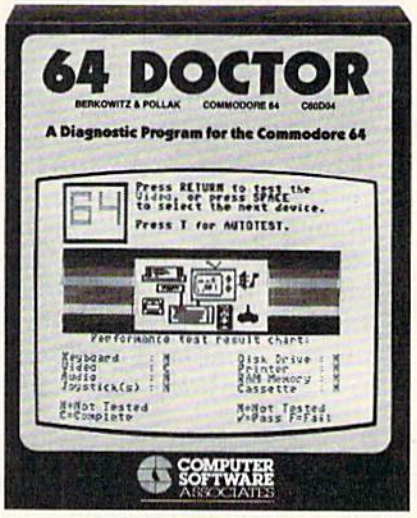
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before doing other programming. This will reset the memory pointers to prevent problems and free up the memory space used by the Customizer.

How SpeedScript Customizer Works

The Customizer is an example of how to have two programs in memory at the same time, using one program to modify the other. This technique is described in *COMPUTE!'s Mapping the Commodore 64*.

Program 1 (line 8) determines whether the computer in use is a VIC or 64 by using the Kernal SCREEN routine. This checks the number of columns, 22 for a VIC, 40 for a 64. (This is how the "MENU" program on the GAZETTE DISK knows if you have a VIC or 64.) Based on which computer it finds, it adjusts the start of BASIC to a point above where SpeedScript normally resides in memory. The boot program prints the necessary commands on the screen, then fills the keyboard buffer (a small area of memory that temporarily stores character information) with a HOME character, two RETURNs, an exclamation point, and the code for LOAD and RUN (because of the exclamation point, the computer ignores the LOAD command and performs the RUN). This is how it boots (automatically loads and runs) Program 2.

The Customizer again checks which computer is in use and sets the values of several variables. Line 50 of Program 2 loads SpeedScript into its usual place in memory. That explains the extra ,1 at the end of the LOAD command. The computer ignores SpeedScript, though, since it is below the current start of BASIC.

Next, it tests to see which version of SpeedScript is currently in memory by PEEKing a designated memory location. It then tells you what it has found (lines 56–64). Lines 66–86 handle the default color selection, and INPUT statements allow you to change the normal values for print formatting (lines 88–122).

To make the program work with all versions of SpeedScript, Program 2 contains its own definition tables. Three of these tables are located in lines 128–132. Depending on what version of SpeedScript is in memory, one of these tables will be used to point to the location in SpeedScript that holds the background color (BL), letter color (LL), and the start of SpeedScript's definition table (DT). Line 134 POKEs these locations with the values you have assigned in Customizer.

If any future versions of SpeedScript become available, the pointers in the Customizer can be changed so that it will modify the new versions. A simple machine language monitor, BASIC PEEKing loop, or even an MLX listing would be enough to find the definition table; just look for consecutive memory locations that hold 5, 75, 66, 5, 58, 2, 1, 27, 14, 15, 18, 0, 0, 0, 0, 0 (the values that are predefined). The variable DT in the Customizer would need to be set equal to the memory location that holds the first value (5) in the list above. The locations referenced by the variables BL and LL might need to be readjusted, as well.

Line 150 of Program 2 determines which table to use for POKEing the BASIC pointers to the right values before saving the modified version of SpeedScript. When a SAVE is performed in BASIC, the start address of the block of memory to be saved is contained in locations 43 and 44 (in standard low-byte/high-byte form). The top of the block to be saved is one position below the value contained in locations 45 and 46 (called the start of BASIC variables, stored in the same format).

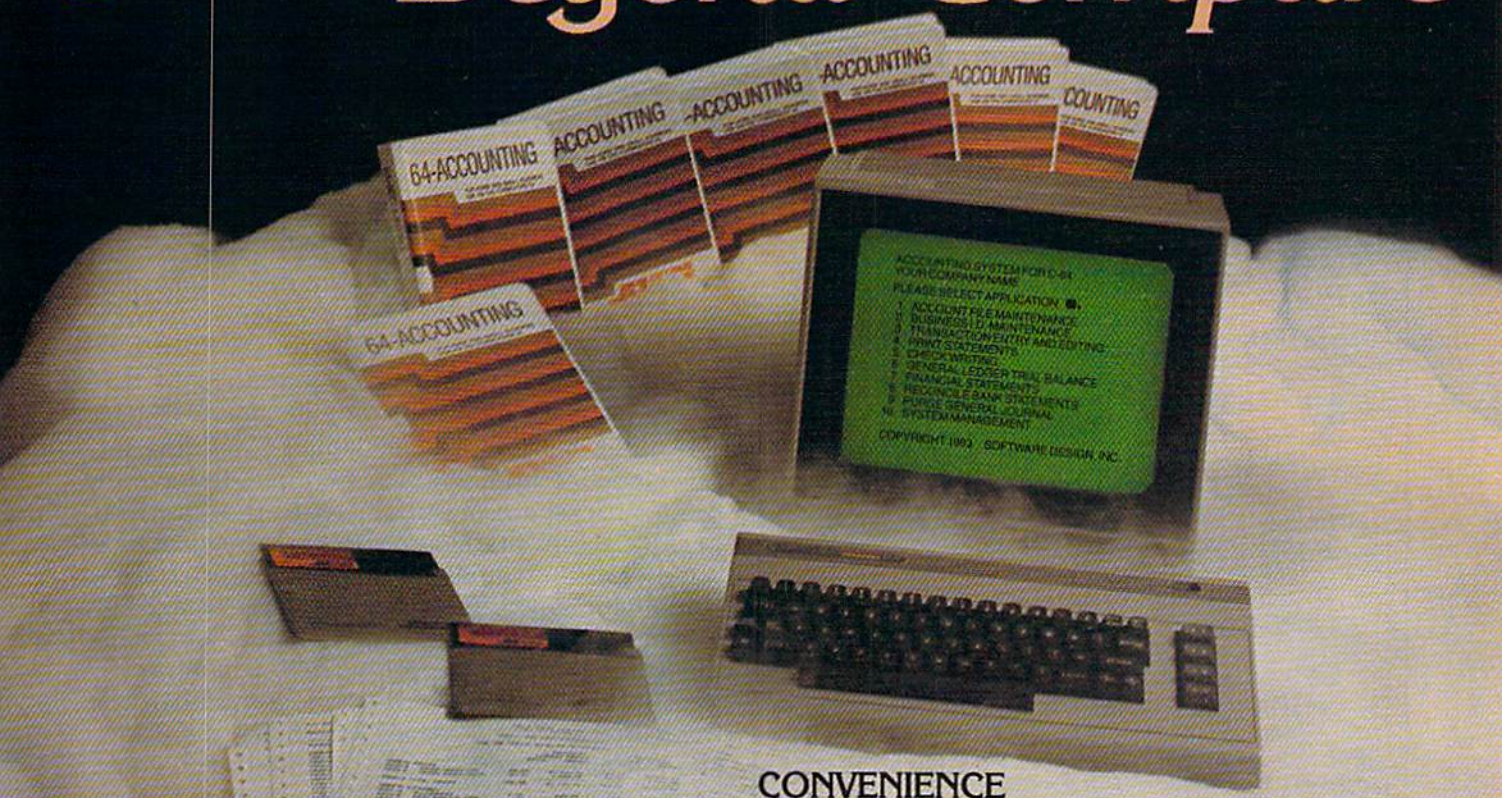
Lines 160–168 print the statements to perform the POKEs and to save and run the new SpeedScript; they also fill the keyboard buffer with a HOME character, three RETURNs, an exclamation point, and the code for LOAD and RUN. The Customizer vanishes from sight as it is replaced by SpeedScript. (Actually, it's still high in memory, but is now unavailable for use.)

More On Sending Printer Codes

Most printer codes are easy to send, and are listed in the printer and interface manuals. Gemini Star and Epson (Graftrax) owners, for example, can send the ESCape code (CTRL-£ 1, represented in this article by [1]) followed by a 4 in the text of the SpeedScript file on the screen to cause the printer to print in italics. To turn the italics print off, send [1]5. Some interfaces, including the Tymac Connection, require sending the ESCape code twice when using emulation mode. (If you have problems, refer to your printer/interface manual or "SpeedScript Revisited" in the May GAZETTE.)

Some printer features require three codes to be sent, though. On the Gemini Star, for example, the code to trigger the continuous underlining mode is ESC−1. Sending this to SpeedScript as [1]−1 doesn't work though. To send the codes properly, you need only define a reverse video number to the value 1. Since [1] is already used by SpeedScript, we'll use [8]. From within SpeedScript, this would look like: [8]=1 (the Customizer allows you to set default values for the reverse video numbers, so they don't have to be defined on the screen). Then, simply insert [1]−[8] immediately before the text you wish to underline. That's fine, but now let's turn it off.

64 Software Beyond Compare



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The code sequence for turning off the continuous underline feature of the Gemini is ESC−0. Unless it is defined otherwise, the default value of [9] in SpeedScript is zero. So, we'll place the following group of characters on the screen after the word or phrase we want underlined: [1]−[9]. Any three-character code sequence can be sent in this manner to the printer, so the Gemini's foreign character sets can be accessed by SpeedScript. See the following table of printer codes for the Gemini, and if you have another printer, refer to your manual and see how many features you can access. We've used SpeedScript to operate letter quality printers as well, and it works fine if you redefine the codes to match those that the interface and printer will accept.

SpeedScript Format To Access Selected Gemini and Epson (Graftrax) Features

(This table uses these preset values in addition to the predefined default settings: [5]=20 [8]=1 [9]=0.)

[2]	enlarged (double-width) print (cleared when a carriage return character is sent)
[3]	condensed print (use [5] instead with some interfaces)**
[4]	pica print
[5]	cancel enlarged print (use [3] instead with some interfaces)**
[1]4	italics on*
[1]5	italics off*
[1]E	emphasized on*
[1]F	emphasized off*
[1]G	double-strike on*
[1]H	double-strike off*
[1]O	disable skip-over perforation
[1]S[8]	subscripts on
[1]S[9]	superscripts on
[1]T	sub/superscripts and unidirectional printing off
[1]U[8]	unidirectional printing on
[1]U[9]	unidirectional off
[1]W[8]	double-wide printing on (alternate method, not cleared by a carriage return character)
[1]W[9]	double-wide printing off (alternate method)
[1]Y[8]	enable buzzer
[1]Y[9]	disable buzzer
[1]−[8]	underline on
[1]−[9]	underline off

* indicates this command works for Epson Graftrax.
** Some interfaces, notably CARDCO and XETEC, swap these two codes, CHR$(15) and CHR$(20).

To access foreign character sets, send [1]7[7] after defining [7] to one of the following values:

0 = American
1 = British
2 = German
3 = Danish
4 = French
5 = Swedish
6 = Italian
7 = Spanish

Some printers use only DIP switches to invoke foreign character sets, so they won't take these codes; just flip the right switches and you'll have it. After selecting the character set you wish to use, some of the special characters may be obtained from the keyboard and some will require the use of the user-definable reverse video numbers in SpeedScript. Compare the printer manual and the Commodore ASCII chart in the *Programmer's Reference Guide* and experiment. A closed bracket (]) in the text on the screen in SpeedScript with the Spanish character set activated, for example, would cause an inverted question mark to be printed (if you're using a Gemini printer).

Even when using the normal character set, symbols on the screen obtained by pressing the Commodore logo key will cause the printer's (or the interface's) characters to be printed. You can access a good number of graphics and special characters (most of the printer's characters with ASCII codes from 161 to 191) from within SpeedScript this way. Just compare the ASCII charts in the printer and computer manuals.

Other features are available by defining the reverse video numbers. For example, to have the printer backspace one character (this allows you to print accent marks), just define a reverse video number to the value 8 (some printer/interface combinations will interpret this value as a graphics command, so consult your manual and define the number as you need it). Then, whenever SpeedScript finds the reverse video number in the text, it will backspace. To activate the printer's internal buzzer during a printout, you could define one of the reverse video numbers to the value 7 and place the defined number in the text where you wish, even in the footer.

If you get confused about all the codes, remember that the first place to go for answers is the manual. If things don't work right, keep trying. Keep track of where you've been and you'll know where to go in the future. Some printer functions will not work while others are in effect. For example, some printers will not print superscripts while printing in emphasized mode, but automatically double-strike the superscript data. If you can't get signals through the interface at first, try using SpeedScript's CTRL-P command and resetting the secondary address to the interface's *transparent* (no ASCII correction) mode. In most cases, once the printer is set it will stay in that mode until you send codes to change it (or until you turn the power off somewhere in the system).

One final note: Whenever you want to include a memo about a file you are SAVEing, use a SHIFT-SPACE to separate the filename from the memo. For example, if you want to SAVE a

note about City League Baseball with the name "clb" and have a note *in the directory* that says "spdscr" (to indicate it is a SpeedScript file), enter the filename as below:

SAVE:clb[SHIFT-SPACE]spdscr (in SpeedScript; a small dot will appear where the [SHIFT-SPACE] was entered), or

SAVE"CLB[SHIFT-SPACE]SPDSCR",8 from BASIC.

The file will LIST in the directory as follows (assuming it is 4 blocks long):

```
4    "CLB"SPDSCR     PRG
```

You can then LOAD the file with the short name (CLB) or the long name (CLB[SHIFT-SPACE]SPDSCR).

See program listings on page 153.

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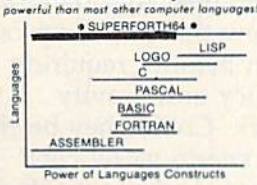

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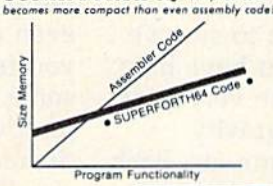

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Three Arcade Games For The VIC-20

Steve Hudson, Assistant Editor

There are a *lot* of arcade games for the VIC-20. Some are ho-hum; others are pretty good. But a few of them are really worth knowing about—and three of the best, *Moon Patrol*, *Jungle Hunt*, and *Pole Position*, have recently been released by Atari as part of the Atarisoft series.

Atarisoft games are conversions of popular Atari games for use on other computers. They may be just what you've been waiting for if you're an arcade fan. But even if you don't own a joystick, these games offer exciting and entertaining evidence of what the VIC can do. After seeing them in action, you may find you're more of an arcade fan than you thought.

Moon Patrol

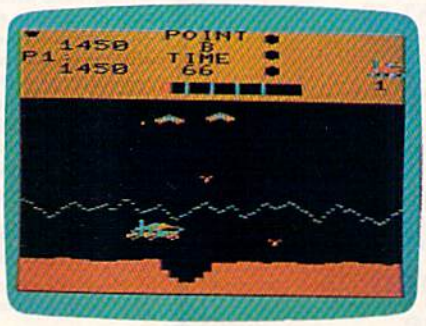
You had always wanted a job with the Luna City Police Department, so you were thrilled when they finally made the offer.

"You'll like it here," said the captain.

"Great place to work," said the sergeant.

"It's a perfect job," said your partner. "Unless you get assigned to *Sector Nine*."

Sector Nine. You'd heard rumors about it: a wasteland plagued with tanks, small rocks, large rocks, and mines, not to mention small craters, large craters, rolling rocks, flying saucers,



You must clear yawning craters in a single bound while watching out for attackers from above in Moon Patrol.

satellites, and even enemy patrol cars. It was a sector from which experienced officers rarely returned, let alone inexperienced rookies.

But that's where you ended up.

"It'll toughen you up," said the captain.

"It's a challenge," said the sergeant.

"It's a perfect job," said your partner. "Just be sure you've made out your will."

Unfortunately, the will was one of the things you never got around to. Just too busy packing up to move to Luna City. With a shrug, you climb into the patrol car.

You'll just have to survive.

Fortunately, you have help. That patrol car is the very latest, with a built-in antigravity jumper and laser cannons. Each is controlled by a single lever (which looks suspiciously like a joystick), and you only have to push the joystick—uh, lever—away from you to make the patrol car jump. To increase the car's speed, push the stick to the right; the car slows down when you move it to the left. The laser cannons (which simultaneously shoot straight up and straight ahead) are controlled by the fire button.

The beat is divided into two patrol routes. One is designated the "beginner" route, for obvious reasons, while the other is known as the "champion" route. There aren't many champions left. A calibrated scale at the top of the screen shows how far you have gone (and how far there is to go), and you can select the route to patrol by pressing f5. Press f3 if you're on patrol by yourself; press it again if someone else is coming along.

Pressing the f1 key starts things rolling. Actually, "bumping" might be a better description of the ride. It's rough out on the lunar landscape, even with those big balloon tires to cushion the ride. The wheels follow the dips in the terrain as your car moves through the smoothly scrolling landscape, and they automatically retract whenever you make an antigravity jump to clear a crater or obstacle. Some barriers, like rocks, can be blasted with the laser. Others you'll have to jump. You hear that there are even a few that sneak up on you from behind, requiring some fancy anti-gravity jumpwork. Could they be the dreaded *enemy patrol cars?*

Whatever they are, they're worth 800 points apiece. You also get points for blasting rocks or flying saucers, for knocking down hostile satellites, for

jumping obstacles, and for dodging rolling rocks.

Realizing the difficulty of your assignment, the Department has given you four patrol cars (one for starters and three in reserve). They've also given you an unlimited supply of laser bullets, as well as a pause control (the space bar) which stops your car in case you want to step outside for a breath of fresh vacuum.

Nice folks, those Luna City administrators.

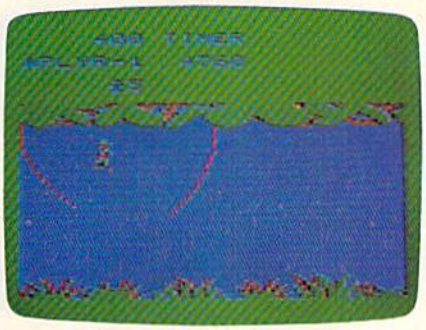
Jungle Hunt

Urban adventurers, here's your chance. Get ready to explore the jungle and be a hero. In *Jungle Hunt*, you must brave the perils of an uncharted wilderness to save your beloved from the cannibals—and though it may be just another rescue mission, it's not just another game.

When the adventure begins, you're at the edge of the jungle and out on a limb—literally—waiting for a swinging vine to come within reach. Closer... closer...you jump, grabbing for the vine before it flies out of reach. If you catch it, you'll be on your way. If not, you start over.

After ten successive vines, you reach the edge of the river. Its surface is broken by gentle waves; it looks quiet and peaceful. Confidently you let go of the vine and dive into the warm, tropical water.

Then you see the shapes, and they're much too big to be mere fish. Crocodiles! It's too late to turn back. Diving to meet the foe, you pull a dagger from your belt. Watch out for those

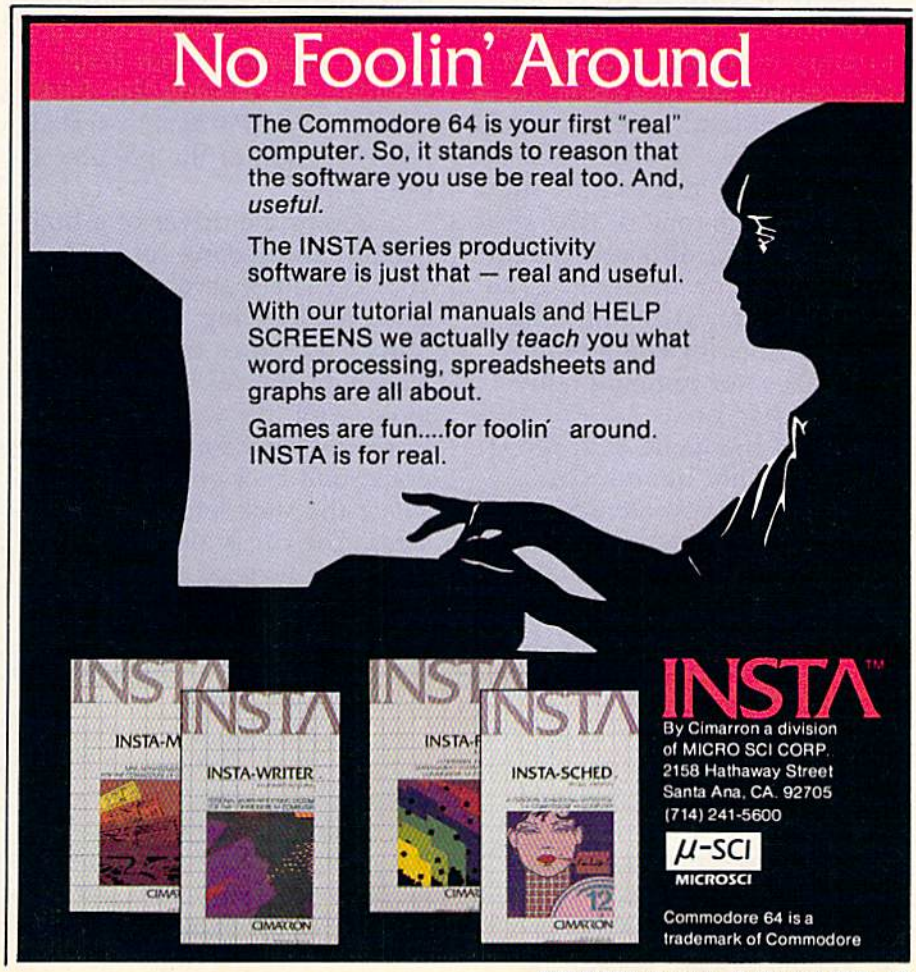


The intrepid jungle explorer swings into the great green unknown in Jungle Hunt.

air bubbles, too. If you get caught in one, you're helpless until you reach the surface. And crocodiles just love helpless heroes for lunch.

Finally, you reach the far bank. There, at the top of a long slope, is the cannibal village, where your beloved awaits your rescue. Up the slope you go, but the natives are rolling boulders down the hill to stop you. Fired by determination, you rush up the slope, jumping the boulders as they come. The cannibal village comes closer—but can you get past the natives in time?

With its constantly moving, smoothly scrolling graphics, *Jungle Hunt* really does put you in a subtropical jungle. Each part of the jungle offers a different challenge, from vine hopping and crocodile dodging to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boulder jumping and finally rescuing the damsel in distress. The graphics are appealing, and you'll find that the sound effects accentuate your enjoyment of the game.

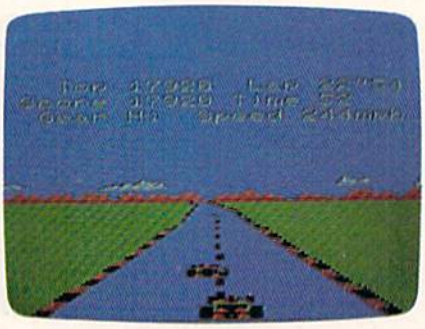
The screen display shows your score, the remaining time, and the number of heroes you have in reserve. When you're crossing the river and have to dive, it also shows how much longer you can hold your breath. That's really all you need. Other information might just be distracting—and you'll need all your concentration to get through the jungle alive.

Game play is straightforward, relying solely on joystick control. Use the fire button to jump or to pull your dagger; the joystick lets you speed up or slow down (and, at the river, to dive or surface as well). Use the function keys to select the number of players (one or two) or to pick a level of difficulty (beginner, regular, or advanced). You win points for swinging from vine to vine, for eliminating crocodiles, for jumping boulders, and so on.

Start the game with the f1 key or the fire button. On higher levels you have fewer men—two instead of five—and you'll find that some situations are much more dangerous.

Pole Position

Most days, the drive to the corner store is not particularly exciting. Between bumpy roads, heavy traffic, and a car that does 0-to-60 in roughly four days, I'm in no danger of imitating an Indy 500 race car driver.



Pole Position *offers long straightaways and challenging curves at a top speed of 244 miles per hour.*

But now and then I imagine roaring along smoothly at 200 miles an hour, taking the turns with steady precision and handling the car with the practiced grace of a skilled pro.

Now VIC owners have a way to experience that thrill without ever leaving the driveway. It's *Pole Position*, a scaled down version of the popular arcade game.

You're the driver of a high performance racing car, and your car is a marvel of sophisticated engineering. Like those Luna City police cars, it's operated by a control lever that looks a lot like your joystick. Push the lever forward to accelerate; pull back to slow down. Move the stick left or right to steer. The car is also equipped with an advanced two-speed transmission that you shift by pushing the fire button, and it has a top speed (in high gear) of 224 miles per hour.

You race on a remarkably realistic field. The course itself is a smooth two-lane track, winding through a fertile green valley. The surrounding mountains sit on the horizon, and the view shifts as you navigate the course—just as it would were you actually driving. There are long straightaways, and there are treacherous turns. Track boundaries are clearly marked in red and black, and though you can't run off the road, you will immediately lose speed if you stray from the pavement and run onto the shoulder.

Select from three skill levels (beginner, intermediate, or advanced) by pressing f5. Start at the beginner level to get a feel for the game and the response of the controls. Then, when you're comfortable with your skills, move up to intermediate and advanced levels.

Press f1 or the fire button to start the qualifying run. As soon as you do, a blimp will fly over the track, trailing a banner that reads "PREPARE TO START." You'll see your car sitting at the starting line. The starting light (on the left side of the screen) will flash red three times, then turn green, and the race is on.

Nothing happens at first, even though the timer is steadily counting down. You'll have to step on the gas (push the joystick forward) to start moving. Hold the stick forward to accelerate (and press the fire button to shift into high gear, for even greater speeds) and you'll soon begin to overtake the other competitors.

That's when you'll really need all of your skill. Steering with the joystick, weave in and out of the pack, running up a good qualifying time without running into other cars. If you collide with another racer, you'll crash with an appropriate burst

of flames and a cacophony of crunching metal. However, you've got an unlimited number of cars (within the allotted 90 seconds per race), so you will at least be able to start up again and run out the clock. It's challenging, to say the least. But the reward is the pole position in the upcoming race, a prize worth any racer's best effort.

Once you've qualified, the race begins. Again, the driver's-eye view is remarkably realistic; you can actually see other racers around you. How many you see depends on your starting position.

During the race, use the joystick to maneuver just as you did in the qualifying run. Again, you have an unlimited number of cars. At the end of the race, the display will indicate your total score, based on distance covered and other cars passed. You'll rack up more points if you shift into high gear to cover more distance and pass more cars. But you'll also run the risk of more frequent crashes and more lost time.

Racing is exciting business, and *Pole Position* captures many of the sights and sounds of the track. The graphics are outstanding; so are the sound effects. You can even press the space bar to temporarily halt the action, in case you need to make a pit stop or grab some milk and cookies.

But the highlight is the excitement of handling the racer itself. Like any vehicle, your VIC racer is harder to control at higher speeds. Though it takes some getting used to, you'll quickly learn to steer into curves and weave in and out of the pack. And it won't be long until the coveted pole position is yours.

Entertaining Exertion

As you play these games, you'll find yourself getting more and more involved in the plots. Certainly they're entertaining. But they require quick reflexes and even a certain measure of strategy to win. Should you jump the moon crater now or wait another second and try for that tank? When should you let go of the vine? Can you accelerate into the curve and still make it by those two cars? The list of decisions goes on and on, and after a session with any of these games you may actually find yourself breathing a little harder than when you began.

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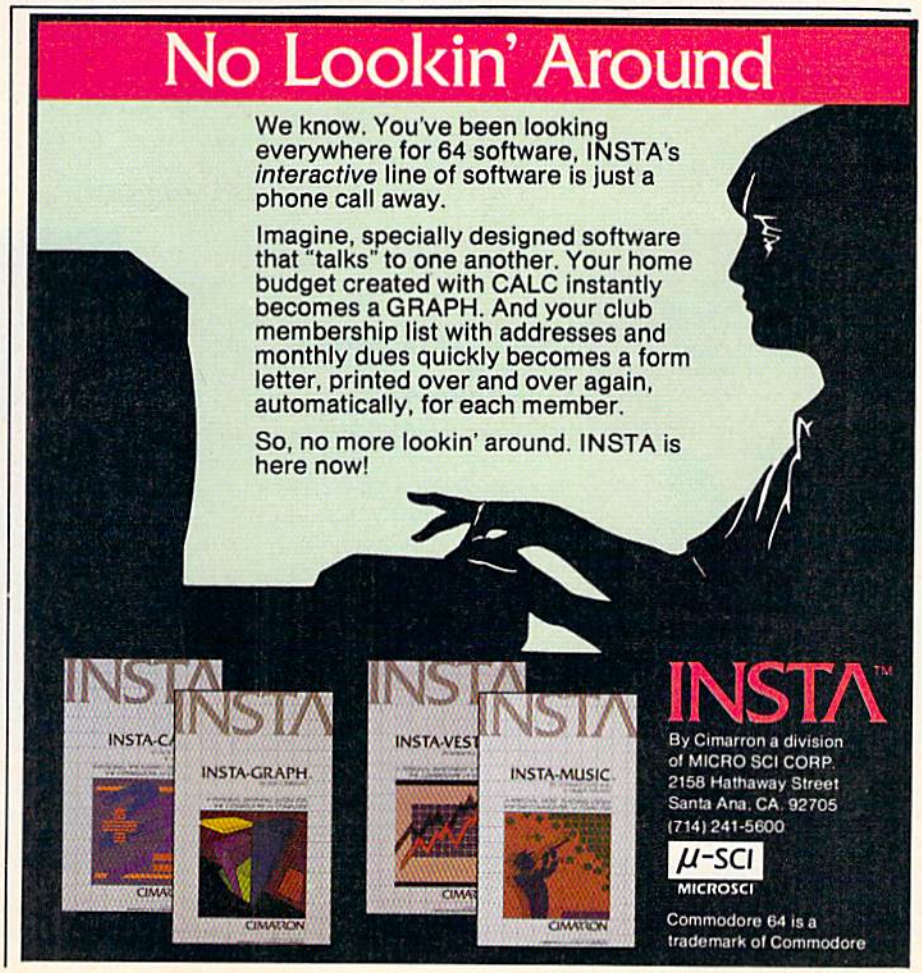
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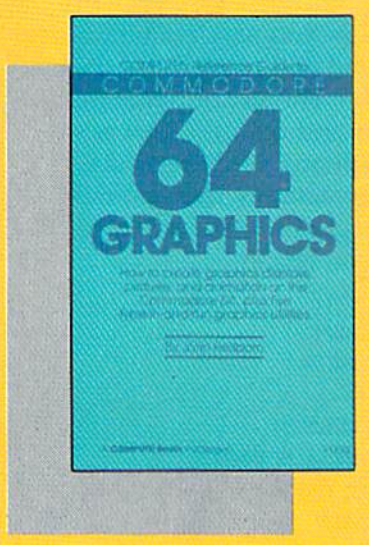

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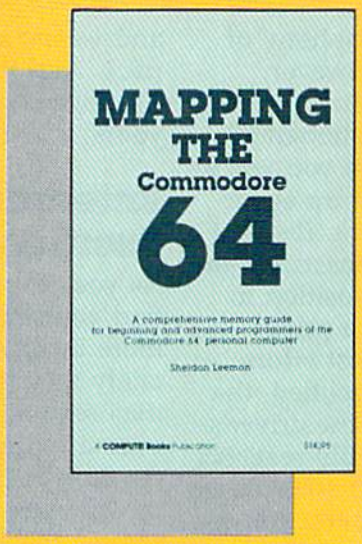

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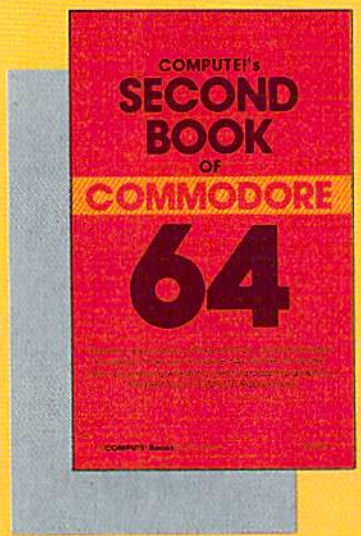

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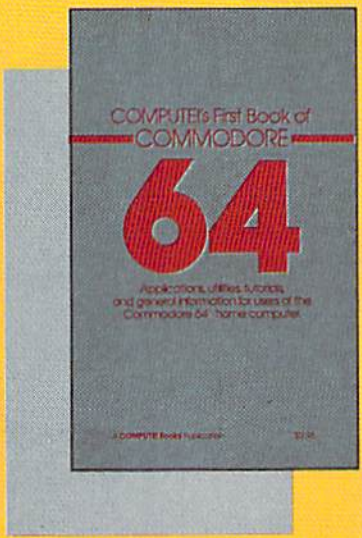

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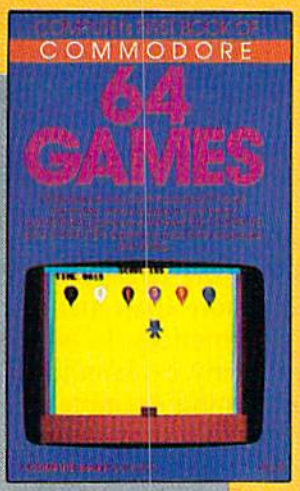

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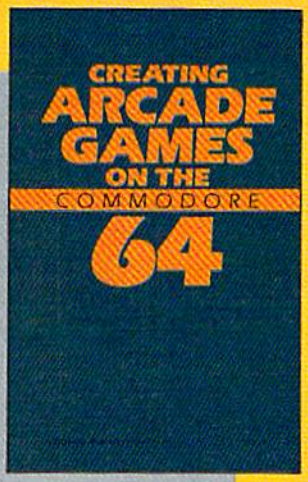

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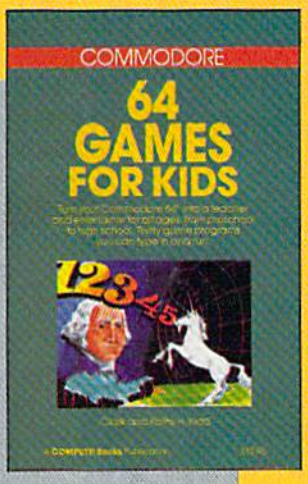

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CodePro-64

Todd Heimarck, Assistant Editor

Learning a language is more than just memorizing a list of words or phrases. And BASIC is not that much different than, say, French. To become truly fluent requires practice and practice and more practice.

If you hopped on a jet to Paris tomorrow, bringing nothing more than a phrasebook and a translator's dictionary, it would be a chore to get across anything more than the simplest of ideas. You might mispronounce a word like "gare," asking directions to the war of the north, when you meant to ask the location of the train depot of the north.

A Step-By-Step Tutorial

CodePro-64 is a software package designed to teach BASIC to beginners. It is like a combination phrasebook/dictionary—it gives you the necessary vocabulary, the first step towards fluency.

If you buy all of your software and don't care to delve into the mysteries of IF-THEN and FOR-NEXT, you probably don't need *CodePro-64*. But for a newcomer to computing who wants to start using BASIC, this package from Systems Management Associates (SMA) can provide an excellent introduction.

It runs on a Commodore 64 and 1541 disk drive. The package includes two disks, a 100+ page manual in a three-ring binder, and a warranty/registration card.

Before you can begin, you must follow the installation procedure, a few steps that write a serial number to the disk as a form of identification and copy-protection. You are also reminded to mail the postage-paid card, which registers your warranty and puts you on a mailing list to receive periodic updates and enhancements.

You then LOAD the main program and you're ready to start learning BASIC. The program is menu-driven; you see a list of choices, accessed by pressing the appropriate key.

It's quite easy to find your way around the menus. Function one (f1) always returns you to the main menu. Pressing f3 brings you back to the local menu. Pressing f7 advances one page, while f8 pages backwards. You don't have to remember all of this, the options appear at the bottom of the screen. At the top of the screen is a reference number which points the way to the appropriate page of the manual.

After making a choice from the menu, you may see a local menu, from which you choose the topic you want to study. To get anywhere in the program requires pressing no more than two keys. The two disks contain 18 programs. Depending on which topic you choose, you may have to wait a minute or two for the program to load, which gives you a chance to scan the relevant chapter in the manual.

Most of the program is text, something like a large electronic book. To turn the page, press f7.

But it's more than just a disk full of sentences. In addition to the many explanations and programming examples, *CodePro-64* offers something called BasicView, which is best described as an animated mini-program. Rather than just reading about FOR-NEXT loops, you can see one in operation. Pressing the space bar moves you line by line through the program. Upon reaching the NEXT statement, an arrow grows from the BASIC line back to the FOR that initiated the loop. A ball travels along the arrow's path, back to the beginning of the loop. In the explanation of GOTO is a BasicView example with arrows pointing every which way, a subtle representation of unstructured programming style.

At times you see questions about the chapter you have finished. Answer correctly and you receive a short congratulatory message. If you are stumped, press the space bar and the correct response is printed. You always have the option of skipping the quizzes and going to the next page.

The manual complements the main program. Pictures of most of the screens are included, as well as additional elaboration on the finer points of programming.

CodePro-64 has four main sections. The first is an introduction, which explains how to use the function keys to move between menus. Also included is a brief introduction to the keyboard—how to switch from uppercase/graphics to upper/

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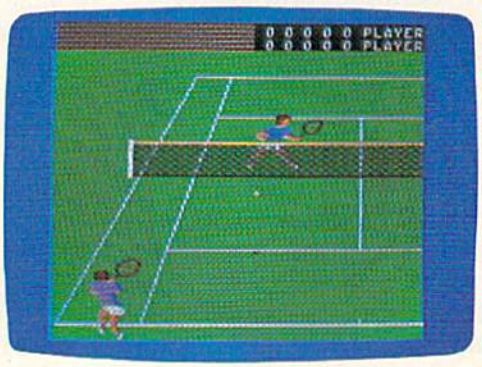

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lowercase characters, the color keys, graphics, quote mode, and so on.

The programming tutorial takes up section two, which begins rather slowly with a detailed explanation of program flow (from low-numbered lines to higher lines), variables (floating point, integer, and string), constants, arrays, expressions, and operators (numeric, string, and logical). The pace quickens when BASIC keywords and commands are introduced, one-by-one, complete with BasicView examples and quizzes.

How to program music and sprites is covered in the third section, a fairly short tutorial about the various registers and necessary POKEs. A sprite-design utility is provided, as well as two musical composition programs. One turns your 64 into a piano-like keyboard, for testing different sounds—violin, tuba, drum, etc. The other allows you to write simple melodies which can be edited and played back.

The final section contains some sample programs and lets you look up the meanings of BASIC keywords (like a dictionary on disk).

New ideas are introduced in a logical order, beginning with elementary concepts like variables and building to more complex programming structures (sprites and music). It is not something that could be completed in an hour or two. There is a lot of information to be digested, which could be spread over a period of days, weeks, or even months.

A BASIC Phrasebook

After completing *CodePro-64*, will you be a programming genius? Frankly, no. You can't learn BASIC in a week; you need practice. But before you can practice, you need to understand the grammar and vocabulary. This is where *CodePro* comes in. It should give you a good headstart on gaining fluency. It's like one of those foreign phrasebooks that gives you stock sentences and a working vocabulary.

A chapter at the front of the manual develops the analogy of a foreign language, emphasizing that to become a good programmer, you must write hundreds of programs. It's not enough just to study about writing programs.

Primarily For Beginners

This package is designed for programming neophytes, new computer owners who don't know a thing about the ins and outs of BASIC. The less you know, the more you'll learn. If you have more than a year's experience, you may find some of the sections a bit simple.

As a general introduction to the Commodore 64, BASIC commands, sprites, and music, it is very good.

The explanations of BASIC commands are thorough. Considering the technical subject matter, it's written in a clear, easy-to-understand style. And it's well conceived and easy to use, due in part to its system of menus.

The self-paced format lets you take as much time as you need to master each chapter, unlike a classroom where you are (inevitably) ahead of or behind the rest of the students.

The BASIC reference table is useful for refreshing your memory of how certain keywords work. It could be a good tool for tracing or flowcharting a BASIC program written by someone else (although disk access can be slow at times).

The sprite utility explains clearly the steps to create sprites and move them about the screen. The two music programs contain some good examples and give you a feel for the many capabilities of the SID chip.

There are some misconceptions and outright mistakes, however.

In the introduction, you are told BASIC program lines can have any number between 0 and 32767. Actually, the maximum line number is 63999 on the Commodore 64. In the same section, floating point numbers are introduced. It is explained that they can have up to nine significant digits—from +999,999,999 to −999,999,999. Scientific notation (which includes numbers such as 1.895E13) is not mentioned. Also, when arrays are introduced, the zero elements are ignored (although they are covered later, in the explanation of DIMension).

Some fairly important subjects are given short shrift: how to read the joystick, some of the POKEs and PEEKs available, the difference between Commodore ASCII and true ASCII, how to

plan out a program and then debug it, various things you can do with tape and disk files. But if every aspect of BASIC were covered, there would probably be ten or twenty disks and a thousand pages of text.

The introduction does too much a bit too quickly. It makes sense to introduce variables and constants before BASIC commands, but a beginner does not need to know that 177 AND 157 equals 145 before learning to use PRINT or INPUT or FOR-NEXT loops. It might be best to skim through the introduction (and ignore the part about logical operators), go on to BASIC, and return to the introduction at some later point. The menu facilitates moving easily to later chapters.

The music and sprite programs do not compare favorably to good commercial software; they are somewhat slow and awkward to use. As programming utilities they are lacking, but as teaching tools they are effective.

CodePro-64 is a solid introduction to BASIC programming on the Commodore 64. Despite the minor flaws, it's a thorough and substantial tutorial.

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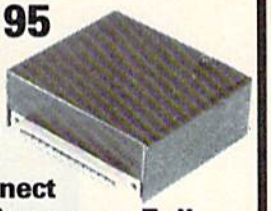
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Micro Worlds For Young Children

Fred D'Ignazio, Associate Editor

Good Robots Vs. Bad Robots

It's fascinating the way children can create a miniature world out of a couple of beat-up old boxes, or a sandbox full of sand, or a bathtub filled with bubbles.

For example, the other day my five-year-old son Eric borrowed a couple of new toy robots I had bought for my speeches and took them down into the basement. "Come here, Daddy!" he called, only five minutes later.

He made me close my eyes, and he led me down the stairs. As I followed Eric down into the cellar, I walked out of my world into a new world he had dreamed up. He had fashioned some cardboard boxes into a mountainous planet. On top of the boxes he had placed buckets and sections of packing styrofoam. A thin layer of playing cards covered the buckets and styrofoam, concealing treacherous traps and pits.

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Poster, Secret Filer and Double Feature Mystery/Adventure designed and developed by Information Technology Design Associates. Turtle Tracks designed and developed by Thomas R. Smith. Square Pairs designed and developed by Glenn M. Kleiman, Teaching Tools: Software, Inc.

Eric had divided the robots into good guys and bad guys. The bad robots were chasing the good robots, but the good robots were tricky. They sidestepped the pits. The bad robots rolled out onto the cards and immediately crashed down into the pits.

Eric and I cheered. Then Eric turned to me and ordered me back up the stairs. "You go away, Daddy," he said. "I want to build a new planet."

The Computer Sandbox

In his book, *Mindstorms: Children, Computers, and Powerful Ideas*, Seymour Papert wrote about "micro worlds," miniature worlds inside the computer that children could create themselves. Children could actually step inside these worlds and become their heroes and heroines.

Computer micro worlds are, of course, made out of software—game programs and simulations that build models of the real world or worlds of fiction and fantasy. Until recently, most computer micro worlds have been very limited in scope and appeal. They have been suitable only for teenagers or adults. Many of the micro worlds have been sexist, violent, and destructive. And they have had repetitive, unimaginative themes: dungeons and dragons, battles in outer space, aerial dog fights, and so on. Most of the video games and arcade games in which the micro worlds appear have been too difficult (and too tall!) for younger children.

In the last twelve months, however, the situation has changed drastically. A new breed of software companies—like Children's Television Workshop, HesWare, The Learning Company, Sunburst, Spinnaker, and Joyce Hakansson Associates—have begun creating computer programs that feature imaginative micro worlds for preteens and younger children.

We recently received a number of these new programs to review, all published by CBS Software, all for the Commodore 64. Here is a sample of some of the computer micro worlds your kids can visit. And, before they head out, ask them if you can tag along. A child's adventure in a micro world can be greatly enhanced if they have Mom or Dad at their side.

Ducks Ahoy!

Ducks Ahoy! is a game for one child aged 3 to 6. The game costs $29.95 on disk, $34.95 on cartridge, and requires a joystick.

Joyce Hakansson Associates designed *Ducks Ahoy!* It is only the second game I've found where pictures on the computer screen were just as appealing as the colorful cartoons on the package. (The first was Joyce Hakansson's *Alf in the Color Caves*, published by Spinnaker for the Commodore 64.)

This game is a delight. You and your child go on a journey to Venice, complete with canals, gondolas, a beach, a boardwalk, a boathouse, bridges, a tiled piazza, and lots of brightly colored Venetian buildings.

The buildings are full of silly, quacking ducks who wander around, then come out the front door and hop into the water. The animation and the sound effects are so good you are tempted to watch the ducks and forget about the game.

Your goal is to take a boat out of the boathouse and (with the joystick) maneuver the boat through the canals and under the bridges to the ducks' houses. You try to predict which duck is the closest to jumping, then you zoom over and place the boat directly in front of him. If you make it in time, the duck leaps into the air and lands, KER-PLOP!, in your boat, nearly capsizing it.

Now you have a choice. Either you can go get another duck, or you can pole your gondola to the beach and unload the duck.

The object of the game is to carry ten ducks to the beach and to allow as few ducks as possible to leap into the water. This would be a fairly simple task if it weren't for a mischievous hippo who floats around the canals under the water. Whenever your boat gets too close to the hippo, he comes up beneath it and capsizes it. If any ducks are on board, they escape. Fortunately, you can keep an eye on the hippo by watching for bubbles in the water. On the other hand, you sometimes get to racing around the canals so fast you don't see the bubbles until it's too late.

Eric and I both enjoyed playing *Ducks Ahoy!* It helped him with his counting, eye-hand coordination, and prediction skills. It was also perfectly suited for his physical and emotional level of development. It was challenging and engaging, but it was not so difficult that he became frustrated.

I found several of the game's features especially attractive. First, Eric kept rescuing the ducks not because he wanted to win the game and get ten ducks to the beach, but because the game was so much fun. I think that's what makes this game so successful. What motivated Eric to keep playing the game was not the educational goal but the sheer thrill of playing.

Second, the graphics, the sound effects, and the music in the game are so good, you really feel like you have entered a micro world—a make-believe world inside the computer. The world has substance, detail, and variety, yet is not so complex that it's distracting or overwhelming for a young child.

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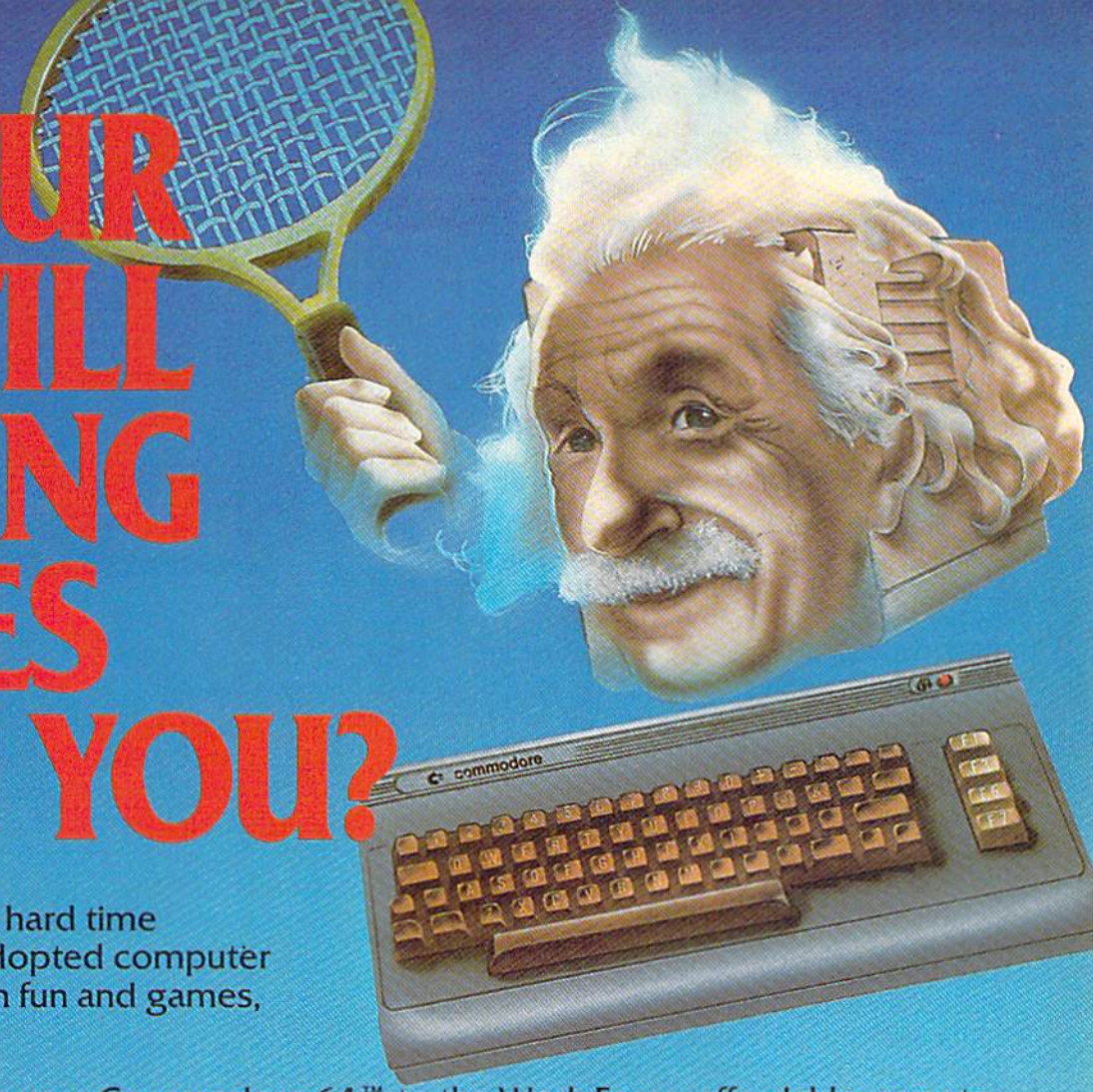

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Third, the game is *funny*. Too few computer games—especially educational games—are humorous. This game is, and that adds to its appeal.

Fourth, the game has *charm*. Unlike many educational games, it doesn't look garish or ugly when compared with activities on other media, such as television, books, or magazines. Instead it is aesthetically pleasing and attractive. Something at the gut level grabs you when you first turn it on.

A Realistic Game

My children and I really enjoyed the *Sea Horse* game. The scrolling animation, the bright, undersea colors, and the music brought the micro world to life. In fact, almost too much life. When my five-year-old, Eric, played it, he burst into tears if his sea horse came too close to a lagoon fish.

Eric wasn't crying because he was going to be eaten. (If a lagoon fish caught his sea horse it would just chase it away, off the screen.) He was crying because of the tension the game creates. He knew that he had to make a move quickly, or those scary fish would come over and get him.

I played the game, and I was surprised at how involved I became. Swimming the sea horse past the mean fish was not a trivial task. For example, I kept ducking into coral caves, but, as often as not, I popped out of another cave right in front of the lagoon fish. I quickly learned that in order to escape I had to plan my moves. I couldn't just panic and dash off in any direction.

I'm proud to say that after being chased out of the lagoon several times, both Eric and I finally mastered sea horse navigation. We successfully maneuvered five tiny sea horses across the lagoon and were rewarded by the raising of a flag on a sunken ship.

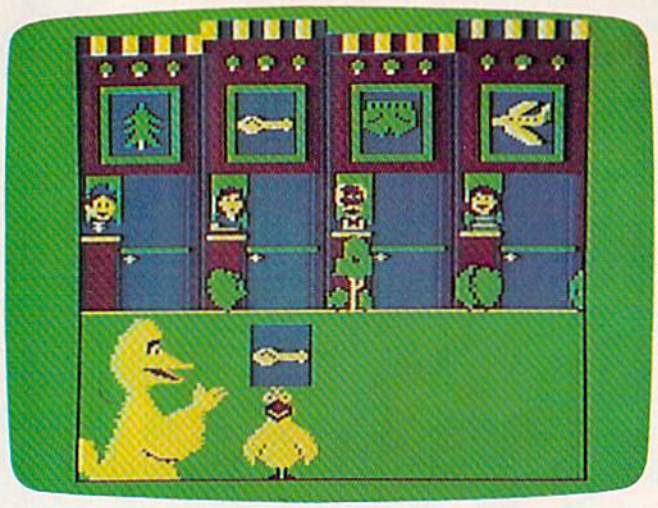
Then a sixth sea horse appeared, back at the beginning of the lagoon. This sea horse was twice the size of the other sea horses. It was too big to squeeze into certain caves, and it was impossible to sneak past a patrolling lagoon fish.

As I write this review, Eric wants me to tell you that *he* has gotten the sixth sea horse across the lagoon—several times, in fact. As for me, well, I haven't quite gotten the knack. But I'm still trying.

Big Bird's Special Delivery

This is a one-player game for children ages 3 to 6. You do not need joysticks; you can use the keyboard to play. The disk version of the game costs $32.95, the cartridge version $37.95.

The game was created for CBS Software by the Children's Television Workshop. It features Big Bird and Little Bird, two of the popular characters from CTW's popular "Sesame Street" TV program.



When the child enters this "micro world," he or she is standing on a sidewalk in front of a row of city buildings. Big Bird appears carrying a special delivery package for Little Bird. Little Bird flaps his wings, flies up to Big Bird, and gets the package. Then it's up to your child to move Little Bird to the building where the package should be delivered.

There are two games and two skill levels for each game. In the first game, *The Same Game*, there are objects in the second-floor windows of each of the buildings. The child has to use the "<" and ">" buttons on the keyboard as left and right arrows to move Little Bird under the building that has a picture that matches the picture on Little Bird's package. Then the child presses RETURN to see if a correct match was made. If so, a person looking out the window nods his head, there is some happy music, and the package floats up to the window. If not, the person in the window shakes his head no, and Little Bird gets another chance.

In the second game, *Find the Right Kind*, everything is the same except this time the child must find a picture in the window that is the same *kind* of thing as the picture on his package. For example, a picture of a bowl appears in the window, and a picture of a spoon is on Little Bird's package. This is a match because the bowl and spoon are both used for eating. (The other three windows, by contrast, have pictures of a piece of fruit, a hand, and a needle and thread.)

Eric and I played this game a couple times, but Eric quickly lost interest. The game gets repetitive since all the child ever sees are the same buildings, with just the pictures in the upstairs windows changing.

Another problem is that the pictures and the words are not very clear. When I was playing the

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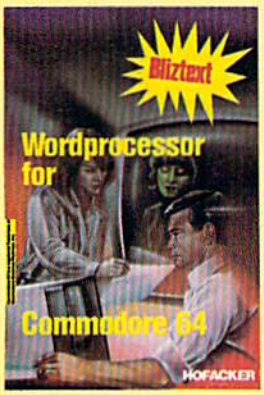

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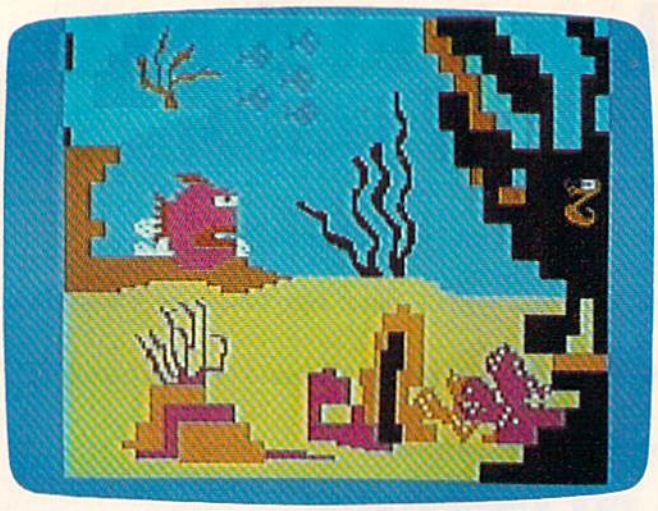
Find the Right Kind game, for example, I thought the special-delivery package had a picture of a stalk of celery. I tried delivering the letter to the building that had a picture of another vegetable (a pumpkin or squash, I couldn't tell which). I was wrong, so I marched Little Bird and the package down the row of buildings, trying one at a time. I finally got the answer right when I reached the picture of what I thought was a hand.

At first I was puzzled. What did a stalk of celery have in common with a hand? Then I realized that the hand must be a glove, and the celery was really a shirt (or was it a coat?). They matched because they were both clothes.

Since the images are small and not especially clear, a young child might have difficulty recognizing the objects on the screen and become frustrated with this game. In that case, a good picture-matching book might be a better choice than the computer.



Sea Horse Hide 'N Seek

Sea Horse Hide 'N Seek is a micro world for children ages 3 to 6. It was designed by Joyce Hakansson Associates. The disk version costs $29.95, the cartridge version $34.95.

It can be played by one or two children, and requires joysticks. Included with the game is a Game Play Guide, an activity book, and a "Find the Sea Horse" poster that children can color themselves.

Sea Horse teaches important skills to young children, including matching colors, eye-to-hand coordination, memory skills, understanding of size relationships, and logical thinking. All of these skills are hidden inside an engaging game set in an undersea micro world that's appropriate for a young child.

In this game, children become little sea horses at the bottom of a coral sea. The children have to swim their sea horses past a line-up of funny but ferocious lagoon-fish who try to gobble them up.

When the sea horses begin swimming through the water, the computer plays friendly, happy music. But a few moments later, the music changes and becomes scary. This warns the little sea horse to watch out because a mean fish is coming her way. The sea horse is much smaller than the fish, so she can't hang around. She has to be clever and escape.

The lagoon fish are not very smart, so one way the sea horse can get away is to change colors (with the press of the joystick button) and camouflage herself as a piece of green or pink coral.

Another way to escape is to squeeze inside a coral cave. The caves always have two openings, so the sea horse will pop out a moment later at the other end. But she has to watch out or she might pop out right in front of the mean lagoon fish. Also, sometimes a grumpy octopus sneaks inside of some of the caves and bounces the sea horse right back out of the cave.

If this happens, the sea horse has two final choices. She can try to swim by the lagoon fish, or she can turn tail and swim back the way she came. But if she does that, she'll still have to face the lagoon fish.

(Desperate sea horses have still another option: They can press the space bar and freeze the lagoon fish. But the space bar freezes sea horses, too, so it's just a temporary respite.)

Peanut Butter Panic

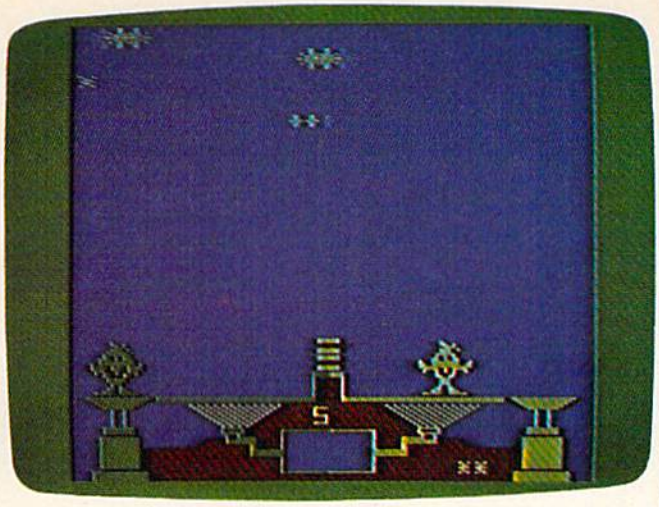
This is a great two-person game. Two children (or an adult and a child) have to work together, share, compromise, and cooperate in order to win.

Peanut Butter Panic was developed for CBS by the Children's Television Workshop. The disk version costs $31.95; the cartridge version $36.95. It requires two joysticks and is suitable for children aged seven and up—which means parents and teachers can enjoy it, too.

My eight-year-old daughter Catie and I played this game together. We each became Nutniks—little round creatures whose main goal in life is to make and eat peanut butter sandwiches.

When the game began, Catie and I were standing on opposite sides of a seesaw-like sandwich machine. As Nutniks, we both wanted to make more peanut butter sandwiches. But to make the machine go, we had to jump up high and snag some stars to power the machine.

When one of us ate a lot of sandwiches we



got fatter and heavier, and we could jump on one side of the seesaw and launch the other person even higher to grab the juiciest stars—the ones that made the best sandwiches. But if we kept jumping, we got skinnier, and we had to go back and eat some more sandwiches. Also, if we spent all our time jumping, a hungry Snarf creature would fly out of the sky and gobble up all our sandwiches. This taught us to time our jumps to keep the Snarf from robbing us.

Peanut Butter Panic is primarily an entertaining game. However, it is also a practical exercise in physics and human cooperation. (Catie and I did our best when we coordinated our body weights with our jumps, when we synchronized our jumps, and when we worked closely together.)

The game encourages communication and interaction between members of the family. And it makes an ideal game for parents to play with their children.

A Warranty, Too

In recent columns, I have called for software packages and materials that are more helpful to the consumer. CBS Software has many of these features, including accurate descriptions and screen shots of the software on the outside of the package; short, simple, easy-to-read user manuals; and activity books. They also have "Startup Cards" to help you begin using the game as soon as you open the package. And all their software has a limited 90-day warranty.

To learn more about these games, you can write or call:

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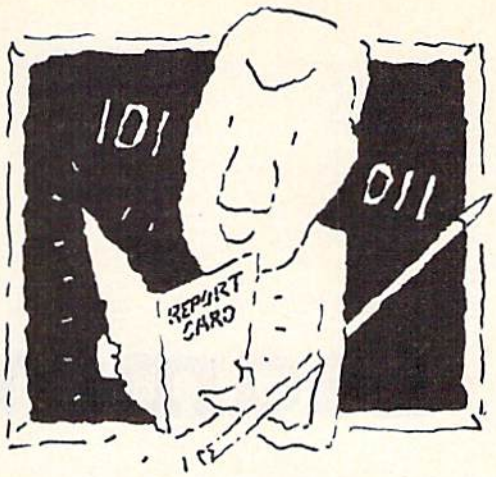

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Learning To Count

William W. Braun

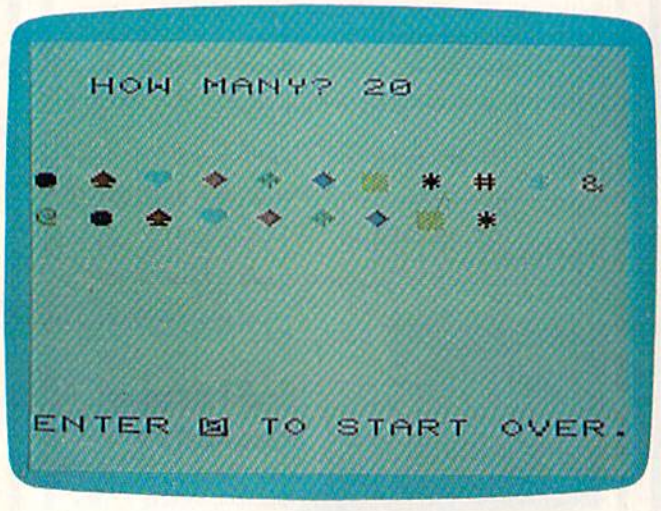
Designed for children in kindergarten through third grade, this colorful and fun program lets you tailor the learning level to your child's needs. For the VIC and 64.

Educational programs are sometimes broad in scope and appropriate for only one learning level. "Learning To Count" teaches a specific concept and allows the parent or instructor to choose the learning level. Although the game is instructive, colorful graphics, sound, and positive rewards make it entertaining for the child.

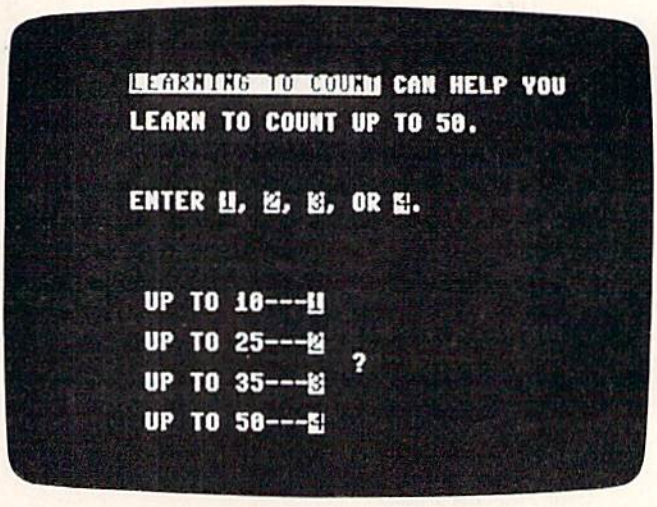
Selecting A Range

When you run the program, you are first asked to input a number from 1 to 4 to set the range of objects to be counted. Choosing the lowest range displays a random number of objects from two to ten, while the highest level covers from two to fifty objects. The child is then asked to count the objects and type in the number. A correct answer is rewarded with a smiling face and short melody. A wrong answer elicits a "Sorry! Try Again" response. After three wrong responses, the correct answer is given.

The program continues until a zero is typed. This way, a parent or instructor can control the length of the program or move to a higher level. When a zero is typed, the screen displays the number of tries, the number right, and the number wrong. Then, after a short graphics display, you are asked if you want to continue and at what level.



A child counts colorful objects and is rewarded for a right answer (VIC version).



A parent or instructor chooses the range of objects to be counted (64 version).

VIC Program Structure

Lines	
28	POKE 808,114 disables the RUN/STOP key so that small fingers will not accidentally stop the program. RUN/STOP–RESTORE will work, however.
50–60	Graphics and sound at the beginning of the program. A = character code. B = color code. C = tone code. S1 = voice location. Z = beginning of screen memory. COL+Z = color memory location.
70–90	Using INPUT D$ and then D=VAL(D$) selects the range of objects to be counted and causes the program to reject any input other than 1 to 4.
100	R = number of right answers. W = number of wrong answers. N = number of tries.
206	A = random number of characters to be POKEd to the screen.
207	Makes sure A is greater than 1.
210	N is incremented for each try, and SCR is the starting point for each line of characters displayed.
225	L = character code. M = color code. K = tone code.
232–236	Make sure each line of characters is separated by a blank line.
245	Allows input of zero to start game again.
260	Detects a correct answer.
270	Detects three consecutive wrong answers.
2000–2007	Create the smiling face and tune.
2500–2501	Give the correct answer display.
3000–3005	Print the score.
4000	Resets the data pointer so the same data for characters, colors, and tones can be used repeatedly.
9000–9001	Data for characters, colors, and tones.

The objects counted by the child are some of the special graphics characters on the VIC and 64, such as hearts and balls. They are displayed in various colors and accompanied by a short tone. The DATA statements at the end of the program contain the codes for the characters, colors, and tones in groups of three.

"Learning To Count" can easily be modified or enhanced with custom characters or several subroutines of graphics and sound displays as rewards for correct answers.

See program listings on page 147.

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SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL
STAFF EDITOR

Q A

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by new VIC-20/ Commodore 64 users and by people shopping for their first home computer.*

Q. ***I have a large collection of programs on cassette tape. Soon I'll be getting a disk drive. Is there any way I can transfer the programs from tape to disk?***

A. With BASIC programs, there's nothing to it. First switch on the computer and disk drive, then insert a formatted disk (see your manual). Next, LOAD the program from tape as usual. Now enter this command:

```
SAVE"0:filename",8 [press RETURN]
```

Look familiar? It's the same SAVE command you've been using to store programs on tape except for the numeral 0 and colon before the filename, and the comma and numeral 8 tacked onto the end. The numeral 8 is the disk drive's *device number,* and it tells the computer to route the data to the disk drive instead of the tape recorder. If you want, you can omit the 0:, but we recommend using it anyway for best results. (The 0: is a vestige from the days of the dual-slot 4040 drives for the Commodore PET computers.) The filename can be any title you wish for the program, up to 16 characters long, just like cassette filenames.

A similar variation of the LOAD command lets you retrieve programs from disk:

```
LOAD"filename",8
```

That takes care of BASIC programs. Unfortunately, transferring machine language programs from tape to disk isn't nearly so simple. Most commercial programs seize control of the computer and never let you leave the application to enter BASIC. Hence, you can't type in any SAVE commands. You'll have to be patient and continue loading these programs from tape.

If the machine language program is one that you typed in from COMPUTE's GAZETTE using MLX, you're in luck. First, load your copy of MLX from tape as usual. When you run MLX, it asks for the starting and ending addresses of the program. To find these two numbers, refer back to the article which described the program. Next, press SHIFT-L to activate the MLX LOAD command. After loading the machine language program from tape, press SHIFT-S to activate the MLX SAVE command. Answer the prompt to save the program on disk. To be safe, save another copy on a backup disk.

Q. ***Is there any company which makes a steering wheel controller for the Commodore 64, like Coleco's steering wheel for its* Turbo *racing game? How would I go about getting one if there isn't one on the market? It doesn't have to be sold with a game, but maybe just by itself, like a joystick, so you can write your own programs for it.***

A. Although we don't know of any steering wheel controllers for the Commodore 64 or VIC-20, it's easy enough to simulate one.

At the heart of steering wheel controllers is a potentiometer (variable resistor). The potentiometer continuously returns a number to the computer which corresponds to the wheel's position. This happens to be exactly how a paddle controller works.

A Commodore paddle returns a 0 when it's turned completely to the left, and 255 when it's rotated completely to the right. Any intermediate position returns a number between 0 and 255. There's no room in this column for a detailed explanation, but briefly, your program must read these numbers from the joystick port and act accordingly. For example, if you're writing a program similar to Atari's *Pole Position,* in which the

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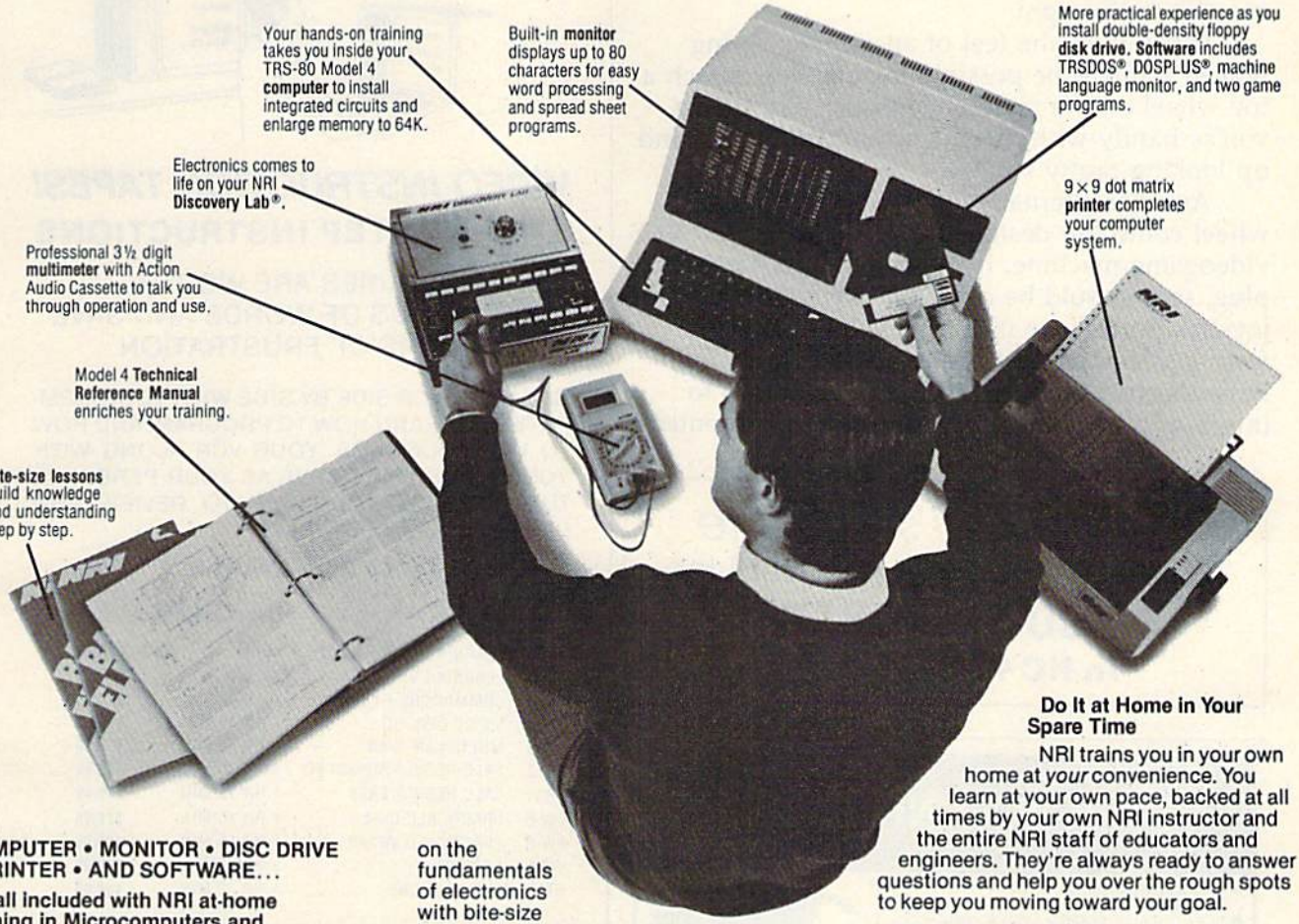
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player steers a racing car along a road, your program could interpret 128 (the midpoint between 0 and 255) as the center position for the car. Any number less than 128 would steer the car to the left, and any number greater than 128 would move it to the right.

If you miss the feel of an actual steering wheel, it might be possible to somehow attach a toy wheel onto a paddle controller. But unless you're handy with tools, it would probably wind up looking pretty strange.

Another alternative is to find the steering wheel controller designed for the Atari 2600 VCS videogame machine. It has a standard Atari-type plug, so it should be compatible with a VIC or 64 joystick port. Since it returns values different from a Commodore paddle controller, you'll have to experiment with different routines to interpret the results properly for your computer.

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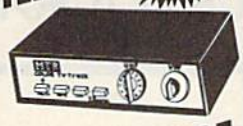

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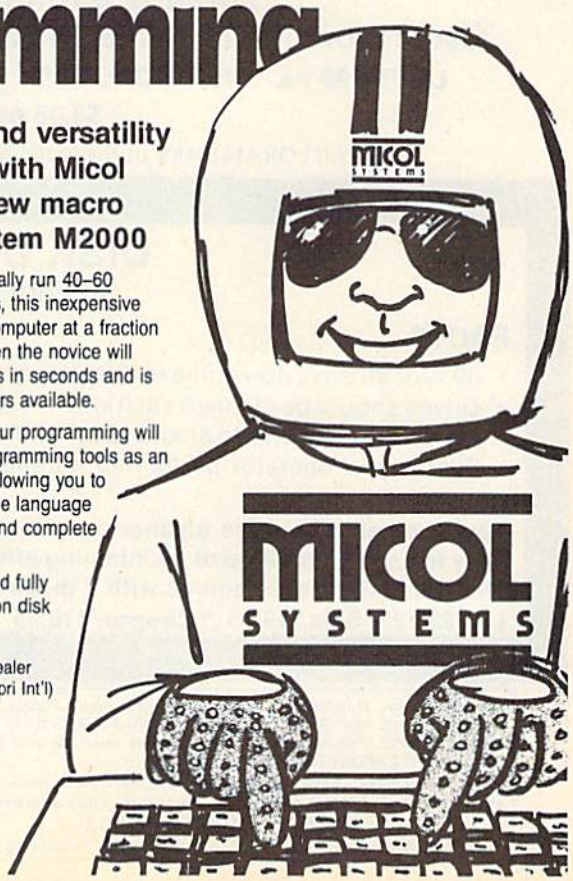

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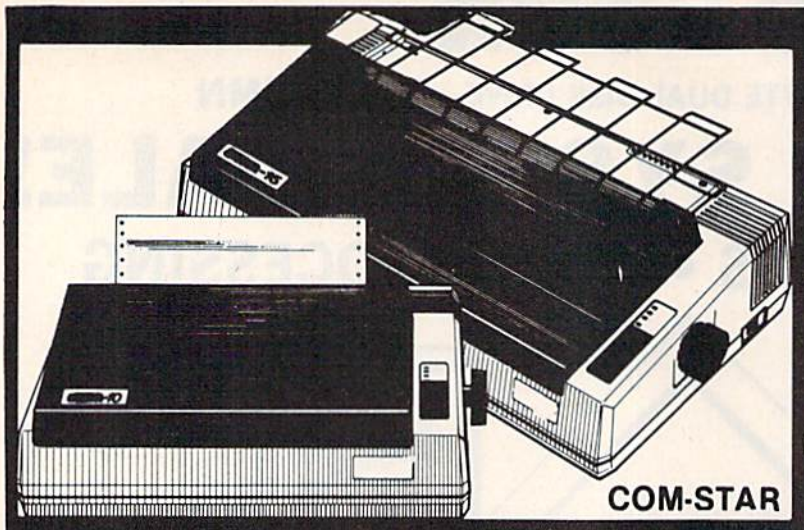

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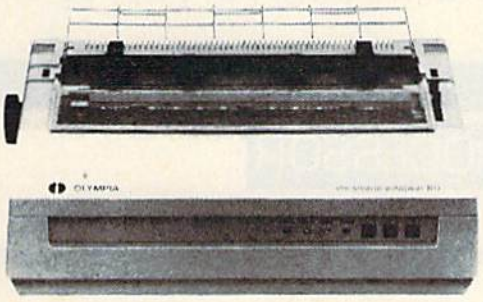

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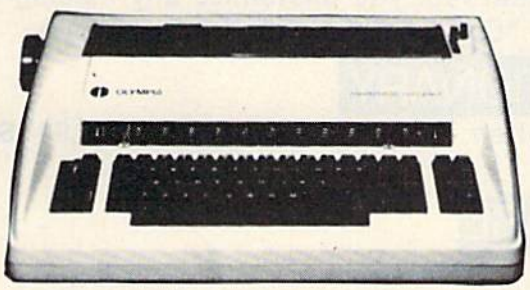

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Information cann be a wonderful thing. Having enough of it when it's needed can save time and money and give you that very nice "together" feeling. **FileWriter** lets you control information so you can enter it, find it and change it — just the way you'd like. Whether it's information about bills, taxes, recipes, club membership, stamp collections, or your new home business, **FileWriter** puts things in order. Simply "draw" any kind of screen you want — just like making up a paper form to hold information. Only there's no paper to slow things down. Once you have your form, add some real computer power: calculate automatically, hold grand totals, test for bad information — for one form or hundreds. There's no need to "program". Just use plain English!! Most of the instructions you'll need are right on the screen for you. Like all CodeWriter programs, your **FileWriter** system gives you your own program on your own disk — in minutes the first time you try. Your new program will search for information any way you'd like, update old information, make new calculations, all at computer speed.

Program Generators!!

Report Writer — Lets you create output formats and calculations in any fashion you please. Requires FileWriter. List $59.00. **Sale $39.95**. (Disk).

FileWriter — Lets you create the input screens and calculations in any fashion you please. List $59.00. **Sale $39.95**. (Disk).

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Adventure Writer — Now you can create your own Adventure game without knowing how to program! Create heroes, villains, magicians and monsters, castles and coffin, even dragons. All in plain English. When your creation is done Adventure Writer will write the program for you on your own disk. Fantastic Adventure tool! List $59.00. **Sale $39.95**. (Disk).

Elf — The visible worksheet is here! Now you can create applications screen by screen that calculates and prints out reports. Buy vs. lease, amortization, comparisons, and summations are just a few of the freeform spreadsheet functions you can do with Elf. List $59.00. **Sale $39.00**. (Disk).

Dialog — Now you can make quizzes and problems for your kids and friends. Make trivia games and other question and answer games for all. You pick the rewards and the punishments. Fantastic teaching aid for kids and party game maker for adults. List $59.00. **Sale $39.95**. (Disk).

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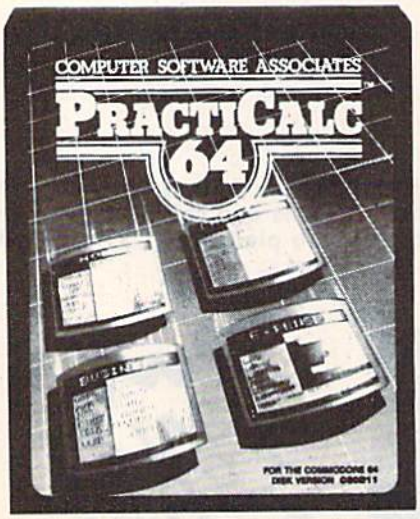

Practicalc 64: A consistent best seller, Practicalc 64 has become a reference standard among Commodore 64 spreadsheets. With features like alphabetic and numeric sorting and searching, variable comumn widths, graphing and 23 math functions, this program is an exceptional value. Practicalc 64 also interacts with Practifile, forming the perfect small business bundle. List $59.95. **Sale $46.95**. Disk. ($39.95 Tape.)

Practifile: Flexibility and large capacity make Practifile the ideal data-base manager for the Commodore 64. Files written with the program are compatible with Practicalc 64 and popular word processing programs such as EasyScript, Word Pro, PageMate and PaperClip. Finally, a full-featured data-base at an affordable price! List $59.95. **Sale $46.95**. Disk. ($39.95 Tape.)

64 Doctor: A special diagnostic program for the Commodore 64, 64 Doctor takes the guesswork out of isolating troublesome hardware problems. The program tests each piece of hardware to pinpoint defects and help prevent costly and time-consuming service calls. An essential program for all Commodore 64 users! List $34.95. **Sale $24.95**. ($19.95 Disk.)

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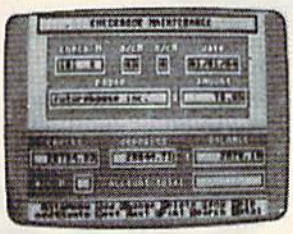

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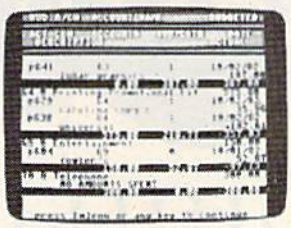

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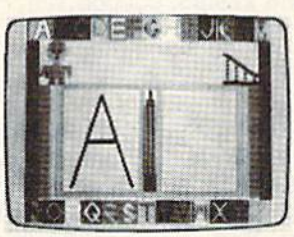
Fantastic Educational Programs

Little Red Riding Hood — TALKS!! — This famous bedtime story comes alive withgraphics, sound, text and SPEECH! Now you and your kids can relive the story of Little Red Riding Hood and improve your reading skills at the same time. Excellent for all ages!! List $34.95. **Sale $24.95** (Disk).

Peripheral Vision — At last a fantastic artists program for your light pen. Draw, erase and save in 14 colors. Zoom in and out, draw or fill circles, squares, triangles, or rectangles with the touch of a pen. Fantastic graphics tool. List $39.95. **Sale $27.95** (Requires light pen).

Animal Crackers — This program helps develop letter and word recognition skills by creating a screen full of animated objects, each representing a letter of the alphabet. Your child selects a letter with the joystick or light pen and suddenly an animal or object will appear with the correct spelling. List $34.95. **Sale $24.95** (Light pen or joystick required) (Disk).



Alphabet Construction Set — This is the most Advanced Alphabet Construction Set on record. The computer voice (it speaks) guides your child through every step as he/she draws the letter on the screen with a light pen. The computer analyzes the letters your child draws, points out mistakes and then suggests the necessary corrections! Fantastic Educational Value. List $34.95. **Sale $24.95**. (Light pen required) (Disk).

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Moptown Hotel — Ages 8-13. To learn how to solve problems, check into this hotel. Children learn advanced problem-solving skills. Colorful Moppet characters open the door to learning.
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Addition Magician — Ages 6-10. An absent-minded magician makes a game out of learning addition. Magical walls and secret prizes encourage flexible thinking about adding. Children become addition magicians!
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Moptown Parade — Ages 6-10. To learn strategy, this is the parade to join. Playful Moppet characters help children develop strategic thinking. Children will never want this parade to pass them by.
List $44.95. **Sale $29.95.** Coupon $24.95

Word Spinner — Ages 6-10. Reading becomes like a ride in an amusement park as children spin through the alphabet and learn to read. With brilliant colors and a whirling word spinner the building blocks of reading are made easy. List $39.95. **Sale $29.95.**
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Juggles' Rainbow — Ages 3-6. Little ones play over and over again with dancing rainbows, whirling windmills and fluttering butterflies. Children learn the spatial concepts of above and below, left and right — and other critical reading and math readiness skills.
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Combine with Musicalc 1 and a graphics printer (Super-10) to produce sheet music from your original composition. List $39.95. **Sale $29.95**. Coupon $24.95.

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Turns your Commodore-64 into a musical keyboard. Comes with over 30 pre-set keyboard scales from Classical to Rock. Requires Musicalc 1. List $39.95. **Sale $29.95**. Coupon $24.95.

You will sound great with Musicalc. To prove it we will send you **FREE** a **record** with sounds created with a Commodore-64 and Musicalc by people without instrument or musical experience. To get your Free Record write or **call 312/382-5244**.

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COMMODORE-64

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LEARNING PAD PROGRAMMING KIT. Once you're familiar with the COMMODORE-64 Computer keyboard and you understand beginning BASIC, the LEARNING PAD programming kit sets you free to develop games and programs! List $29.95. **Sale $19.95**. (Disk)

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BEARJAM. As children play this game and feed the friendly animated bear, they sharpen the visual skills so essential for success in learing. BearJam is a great reading-readiness game. List $39.95. **Sale $29.95.** (Cart)

PIANO MAESTRO. Chalk Board's MicroMaestro software turns your PowerPad into a piano keyboard. Touch the keys. You hear the music and see your composition right on the screen. It is the fun way to learn music. List $29.95. **Sale $24.95** (Cart)

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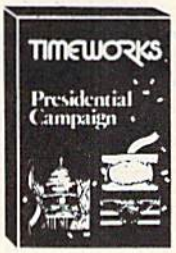

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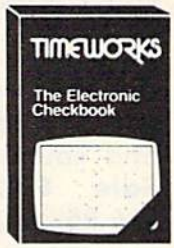
Check recording, sorting and balancing system. Organize and record checkbook transactions for easy recall and sorting by category. A must for tax time. Also produce the sum and average for transaction amounts by indexed categories. Interface with the MONEY MANAGER for graphic detail and actual-budget comparison. List $24.95. **Sale** $19.95.



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Learn Basic Programming from the ground up. This first step takes you through the actual design of Lunar Lander, using moving graphics.

Shows in detail how basic programming works and what should go into a good game. List $24.95. **Sale $19.95.**

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Manuals are written in plain, easy to follow English. The 8 step approach to program design is fully explained and can easily be applied to your future programming adventures.

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Intermediate game design and Sprite Builder. Design Slot Machine and study intermediate programming including arrays, subroutines, sound, special function keys, and random function. Plus Sprites are covered in detail and a Sprite Editor is included. List $24.95. **Sale $19.95.**

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Intermediate Data Base design. Instead of games you may want to go the business route. Use this program to develop a Data Base Manager to allow quick storage and retrieval of any information. Learn disk/tape storage, sorting, menus, plus multi dimensioned arrays, plus a whole lot more. List $24.95. **Sale $19.95.**

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At last a good educational game. You must wander through 3-D mazes until you encounter dragons, then you must answer the algebra problems they give you. A right answer gets you a free ride, a wrong answer gets you eaten. Fantastic educational value. (Tape or Disk.) List $29.95. **Sale $24.95.**

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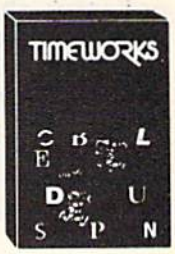
The screen is sprinkled with the letters from one of 20 words of your choice along with a few extra random ones. Use your Joystick to sting the letters in the right order but don't sting the wrong ones or cross your path or you explode. Fantastic educational value. Fun for all ages. List $24.95. **Sale $17.95.**



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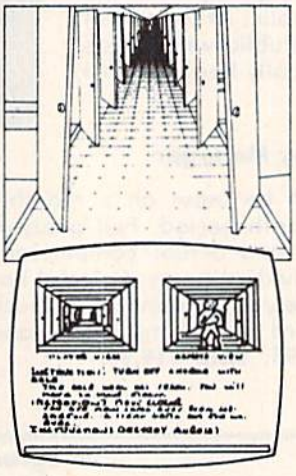

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One of the best graphic adventures we've seen. Get yourself out of the Asylum past guards and secret doors. Stunning, 3D graphics will make you feel like an inmate. List $34.95. **Sale $24.95**. Coupon $22.00. (Tape or Disk)

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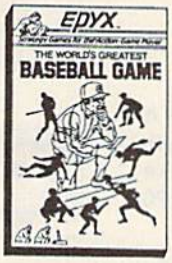
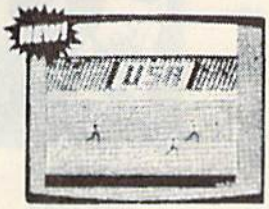


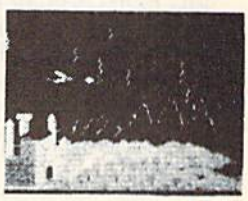
World's Greatest Baseball — Finally a great sports game. Realistic right down to the playing field. Control all the actions--even the outfielders. Play realistic baseball all year round. (Fantastic graphics, action, and sound!) (Disk) List $34.95 **Sale $24.95.**

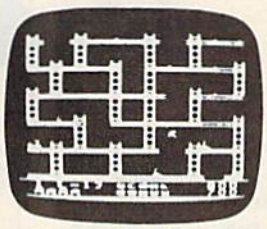
Fax — Stop wasting quarters! Now you can play Exidy's Fax at home. Play against the computer or an opponent to get the answer first, over 3,700 questions dealing with sports, television, movies, histories, and many more subjects will keep you playing for hours (a must for trivia buffs). List $34.95. **Sale $24.95.** (disk only).



Summer Games — Now you can compete in the Olympics right along with the real competitors. Compete in track, swimming, diving, cycling, archery, weight lifting, rowing and more. This Olympic game is so realistic it even includes a beautiful opening ceremony and an awards presentation after each event. (Highly recommended, by far the best Olympics game we've seen). List $39.95. **Sale $28.00.** (disk only).

Dragon Riders of Pern — Based on the best selling book series by Anne McCaffey (over 10 million sold). This program forces you to make an alliance with the Lord holders, then mount your dragon (stunning graphics) and battle the dreaded thread. (Super fast action with a great theme). List $39.95. **Sale $24.00.** (tape/disk).





Jumpman — If you like Donkey Kong, you'll love Jumpman. Over 30 different screens with 8 speeds and 5 skill levels make this the fastest action game in the country. You must leap girders, climb ropes, and scale ladders to reach and diffuse bombs while avoiding robots, birds, bullets, explosives, crumbling walls, vanishing escape routes, and many other obstacles. (Truly a fantastic game!) List $39.95. **Sale $24.95** (Disk/Tape.)

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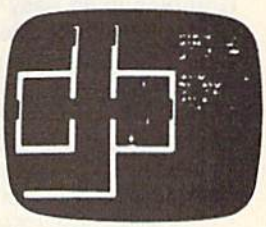

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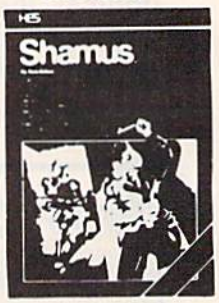

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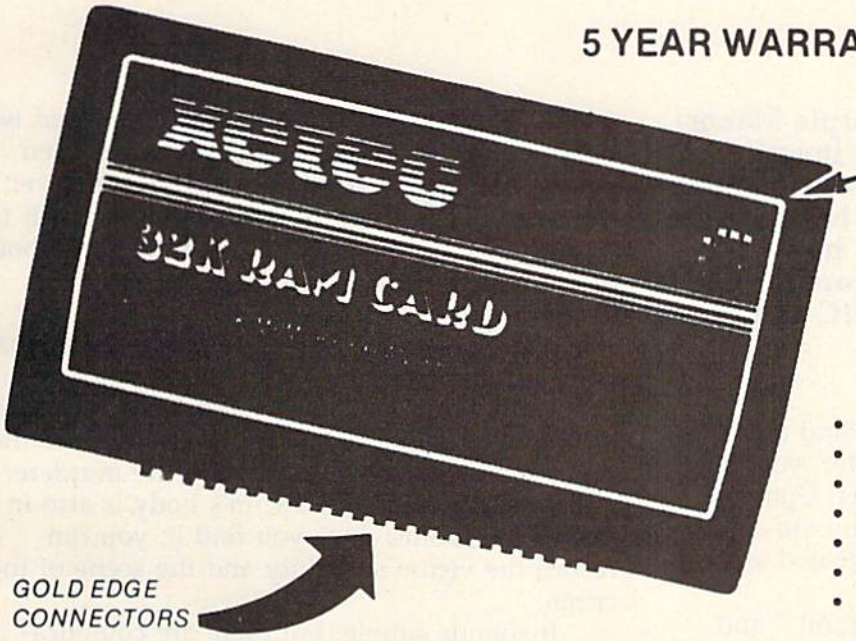

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Mystery At Marple Manor

John R. Prager

You've been summoned to Marple Manor on a dark and stormy night to investigate the unexpected demise of one of the dinner guests. Clues are everywhere, but can you discover who did it, to whom, how, and where? A mystery text-adventure for one to six players. Versions for the VIC and 64.

Searching through the study, you find a duelling pistol hidden under a cushion. Later, you discover the cook cowering in a closet. Upon unlocking the greenhouse door, you are aghast to find the body of the Duchess concealed among the potted ferns.

Your job is to find out "whodunit," and how, before the other detectives crack the case. They are a shifty lot, who might hide vital clues or steal pieces of evidence you are carrying, just to throw you off the track. There are over 15,000 possible solutions, but only one correct answer, chosen anew each time the program is run. It's a race against your fellow sleuths to find that unique answer.

"Mystery At Marple Manor" may be a departure from the computer games you're used to playing. Patient strategy, rather than quick reflexes, is of paramount importance to the successful detective. In many ways, the game resembles computer text-adventure games as well as familiar board games of logic and deduction.

For Sleuths Only

In order to solve the case, you must correctly identify the murderer, the victim, the weapon used, and the room where the heinous deed was done. Before you arrived, the manor held ten people and twelve possible weapons; however, the murderer has fled to parts unknown with the weapon he or she used, leaving behind the body of the victim, eight living suspects, and only eleven weapons.

As you travel through the mansion, use paper and pencil to keep a careful record of all suspects and weapons you see. When you've located all the objects that remain in the house, use the process of elimination to identify the murderer and weapon used. The victim's body is also in one of the rooms; once you find it, you can record the victim's identity and the scene of the crime.

It sounds simple, but there are complications. At the outset, many of the suspects and weapons will be hidden in the various nooks and crannies of the manor. Players may have to search each room thoroughly, possibly several times, before all the concealed items are discovered. The detectives can even pick up and move items from room to room in the course of play. Suspects and the body of the victim cannot be moved, but, in the 64 version (Program 1), they can be hidden by detectives in the same room.

Marple Manor is a house of 14 rooms. To better assist you while maneuvering through the manor, refer to the floorplan with this article. Up to six people can play, and all players begin the game in the entry foyer at the southern end of the house. They alternate turns until either one player correctly solves the mystery, or until all players have made incorrect guesses and, consequently, have been eliminated from the game.

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VIP Terminal ready 11:15:28
Dear Pepper,

You're right. This VIP Terminal is the only terminal for the C64 worth owning. That freebie software that came with my modem just didn't work, especially with my new smartmodem. The 80 column display alone was well worth the $49.95 — much less the 40, 64 and 106 character displays — and it doesn't need any hardware changes. Imagine 106 characters on 25 lines. Heck, there's more text on my screen than on my uncle's Apple or my dad's IBM-PC!

I put auto-dial to work right away. I auto-dialed CompuServe, but couldn't get through, so I had VIP Terminal redial 'til it got through — it dialed five minutes straight! Then I auto-logged on with one of my 20 programmed keys, and downloaded some graphics screens, and stock quotes for dad. I printed it and saved it to disk as it came on the screen. Wow! And now I can send you my programs automatically. I got yours and they worked right off.

Those icons — you know, like the Apple Lisa — are a lot of fun. I also like the menus, function keys, highlights, help tables — great for a newcomer like me. And with the many options there isn't a computer I can't talk to.

What's really neat is that Softlaw has a whole VIP Library of interactive programs, including a word processor, spreadsheet and database, which will be out soon. Sis promised me the whole set for my birthday.

I see by the built-in "old clock" on the screen that long-distance rates are down. Got to call that L.A. BBS. Yep, there goes the alarm. Later.

- Lone

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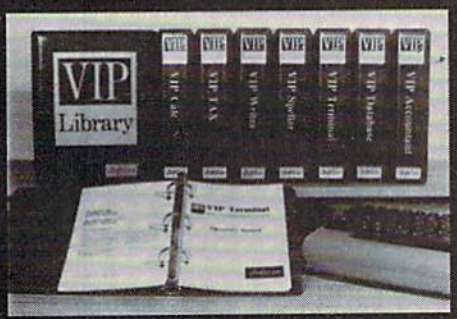

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VIP Library programs are not limited by the size of your computer's memory. All programs use virtual memory techniques to allow creation and use of files larger than your computer's available work area. You're only limited by the space on your disk!

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All **VIP Library** programs are compatible with each other and other computers for easy file transfer. Each uses ASCII, the universal language of computer communications so that files can be sent to and received from other computers without modification! The Library also gives you the benefit of a consistent icon and command structure. Once you have learned one program, the others will come easily.

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Who Is Softlaw?

Softlaw Corporation has years of software experience in micros. We currently offer the full-line **VIP Library** for other micros in the U.S. and in Europe. Now we are bringing this experience to the Commodore 64 so you get ultra-high quality software at very affordable prices.

Softlaw

9072 Lyndale Avenue South
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Although each player takes a separate turn, the game works just as well if the players form teams of equal size. This allows two or three teammates to travel through the house independently, yet share their discoveries and arrive at a solution together.

Passwords And Locked Doors

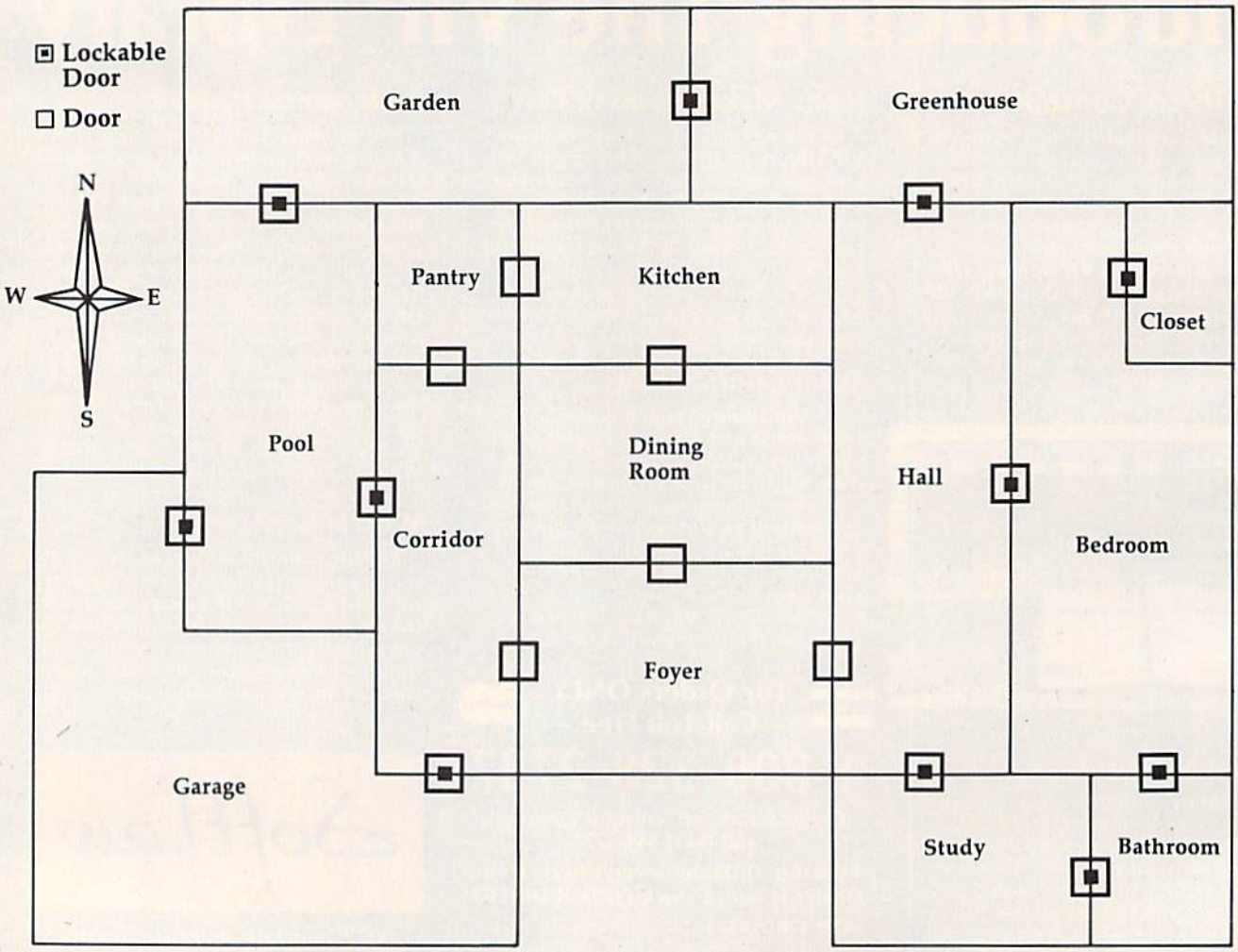
In the 64 version, the game begins with a title screen and a thunderclap. This gives contestants time to assign player numbers, organize teams (if desired), and ready their notepads. Type a number from 1 to 6 to enter the number of players, and the game begins.

At this point, all players except the first should position themselves so they can't see the screen. After all, each player will be acquiring information in the course of the game that he or she wishes to keep secret from the others for as long as possible. To help preserve secrecy, you will be asked to enter a secret code on your first turn. This password can be any two characters from the keyboard—numerals, letters, spaces, special symbols, or even function keys. Be sure to choose a code that you can recall easily, and bear in mind that the computer will recognize shifted keys and unshifted keys as different entries. On later turns, you must enter your secret code before going on. This prevents other players from illegally using your turn to gather information for themselves.

After you type in your code, the computer reminds you of your current location and asks if you wish to move. If you answer yes, the computer lists all possible exits available to you. Type in the appropriate compass direction to move to a new room: N, S, E, or W. If you type in a direction that does not have a matching door—for example, if you try to move south from the foyer—your move will be blocked.

Your move may also be blocked if you attempt to move through a locked door. Eleven doors in Marple Manor can be fastened shut, and, at the start of the game, most of these doors

Floorplan Of Marple Manor



are locked. (See the floorplan diagram.) To move through a locked door, you must possess a key which matches the lock; for example, the bedroom key will open any door that adjoins the bedroom. All of these keys are initially placed in the pantry. One special key, the skeleton key, can open any locked door but is powerless to lock doors; its starting location will vary from game to game.

Whether or not you move to a new room, the computer describes your surroundings. It tells you the room you are in; notes what item you carry, if any; lists all suspects, weapons, and keys in view; and names all the other players in the room.

Searching For Clues

Following the description, you are presented with a list of choices. Select from these options by pressing the appropriate key. One option is to take no action; this allows you to end your turn and readies the computer for the next player.

Searching is the most popular option. At the start of play, many suspects and items are hidden in various rooms. Additionally, players may use the *Hide* option to stow away even more clues. Searching is the only way to find these hidden objects. Each time a player searches in a given room, there is a 50% chance of finding each item hidden in that area. For this reason, a room may be searched several times before all the objects it contains are revealed. A searching player does not automatically take any item he finds.

The Hide option is the logical counterpart to the Search. You may choose to hide any one object in the room you occupy. This object may be a weapon, a suspect, a key, or the corpse. You may even hide the object you carry, if any. But you can't hide yourself or another player. Hiding items makes it more difficult for your opponents to locate the clues they need in order to win. Don't forget, of course, to record each clue in your notes before you hide it. Hidden objects may be discovered subsequently by any player searching in the room.

The *Take* option allows you to pick up a weapon or key in the room you occupy. You may only carry one item at any time. If you choose the Take option while holding an object, you automatically drop the article currently held in favor of the new one. Alternatively, the *Drop* option allows you to discard an item without tak ing another. The usefulness of the Take option cannot be overstated: Carrying keys allows you to pass through locked doors, while weapons in your possession cannot be discovered by players who search. However, the *Pilfer* option allows a player to steal from another player in the same room. The pilfering player drops any item carried, and receives the object the other player had held.

When you are certain you have the solution to the case, select the *Accuse* option. You will be asked to identify the murderer, the victim, the weapon, and the scene of the crime from lists of the possibilities. An incorrect guess eliminates you from further play. Give the correct solution, though, and you win the game.

VIC Version Notes

Gameplay for the VIC-20 version (Program 2) varies somewhat from the preceding description. Sound effects have been deleted from the game, and the introductory title and prompts throughout the game have been streamlined. Secret codes are not used. There are no keys or lockable doors; investigators may pass freely from one room to another in the manor. Finally, the Hide option has been removed, and the effectiveness of searching is increased to 60%. Even with these extensive modifications, less than 100 bytes of free memory remain when the program is running, so be sure not to add any spaces as you type in the program.

The net effect of these changes is to increase player interaction. It still retains the flavor and excitement of the larger version. Since players cannot hide objects in this version, and since there is no need to carry keys, players use the Take option to acquire weapons. Consequently, pilfering is more frequent in this version of the game, and more often useful to the player choosing that option.

If you wish to avoid typing in the entire listing, I'll make a copy of either version for you. Send $3 and a blank disk, (sorry, no tapes) in a stamped, self-addressed disk mailer to:

John R. Prager
417 S. Johnson
Bay City, MI 48706

Be sure to specify whether you want the 64 or VIC version.

See program listings on page 154.

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A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE!'s GAZETTE for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, COMPUTE!'s GAZETTE for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as "{DOWN}". Anything within a set of braces is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s GAZETTE* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it*. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.
2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.
3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type *COMPUTE!'s GAZETTE* Programs" elsewhere in the magazine).

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s GAZETTE *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s GAZETTE *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

How To Type In COMPUTE!'s GAZETTE Programs

Many of the programs which are listed in COMPUTE!'s GAZETTE contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, {}, you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: You know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR	
{DOWN}	↑ CRSR	
{LEFT}	SHIFT + ← CRSR	
{RIGHT}	← CRSR	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{1}	C= + 1	
{2}	C= + 2	
{3}	C= + 3	
{4}	C= + 4	
{5}	C= + 5	
{6}	C= + 6	
{7}	C= + 7	
{8}	C= + 8	
{F1}	f1	
{F2}	SHIFT + f1	
{F3}	f3	
{F4}	SHIFT + f3	
{F5}	f5	
{F6}	SHIFT + f5	
{F7}	f7	
{F8}	SHIFT + f7	

Treasure Hunt

Calvin Overhulser

"Treasure Hunt" is a joystick-controlled action game originally written for the VIC-20 with at least 3K of expanded memory. An easy technique is also included to RUN the program with an 8K or larger expander. We've added a version for the 64.

Your goal in "Treasure Hunt" is to collect lost pirate treasure on a secluded island while avoiding a variety of obstacles. The treasure includes gold coins, gold bars, and a treasure chest. The obstacles are rum kegs, quicksand bogs, and spirits of ancient pirates (which appear as skulls), any of which can spell disaster for a treasure hunter. When most of the gold coins and gold bars are collected (you are allowed to leave one gold coin and/or one gold bar), you get a new screen.

You don't have to pick up the treasure chest but you earn more points if you do; just remember to hold the fire button down while attempting to cross the bog. The round number and the current score are displayed as the game progresses.

There are five skill levels. The level you choose determines the number of fixed and moving obstacles. The skill level also determines the points earned for each treasure collected.

VIC Program Construction

The main loop is in lines 65–90. The subroutines at lines 91–98 are used to update the location of both the treasure hunter and the moving obstacles (skulls). In line 70 for the treasure hunter and in line 610 for the active skull, ON-GOSUB allows the new location for either to be calculated using the same subroutines.

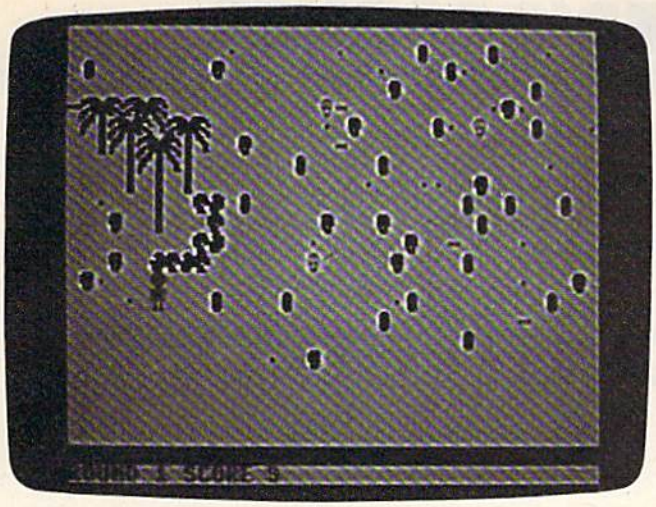
The machine language joystick routine is contained in the DATA statements in lines 6035–6055. The routine is READ and POKEd into the cassette buffer by line 35. The SYS in line 65 calls the machine language routine which puts the joystick condition in address 830 and the fire button condition in address 831.

Line 605 randomly selects which of the skulls will move. Only one can move for each move of the treasure hunter; if all were moved, the game would slow down considerably.

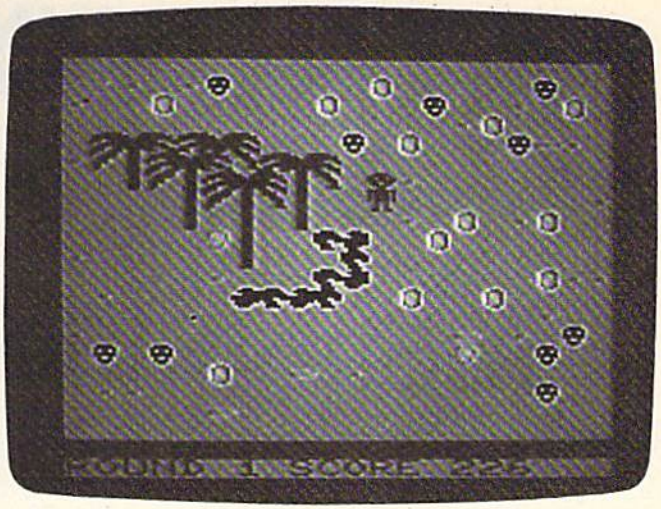
Line 30 moves part of the VIC character set (screen codes 0–63) into RAM addresses 7168–7679. The custom character information is contained in the DATA statements in lines 6060–6090, and is READ and POKEd into the place of some of the VIC's relocated characters by lines 40 and 41. This table shows which characters are replaced with custom characters.

Custom Characters In Treasure Hunt

Screen Code	Original Character	Custom Character
35	#	border and tree trunk
36	$	palm leaves
37	%	palm leaves
38	&	palm leaves
39	'	palm leaves
40	(	palm leaves
41	)	palm leaves
42	*	skull
43	+	bog
44	,	bog
45	-	rum keg
46	.	top of treasure hunter
47	/	bottom of treasure hunter
58	:	treasure chest, left
59	;	treasure chest, right
60	<	gold coin
61	=	gold bar



The treasure hunter has collected most of the gold from the bottom of the screen (64 version).



Grab the treasure chest and you score 200 points (VIC version).

VIC Program Variables

Program	Variables
A	variable in READ statements
B	variable for screen code for gold coins and gold bars
D	random numbers
I	miscellaneous counters in FOR/NEXT loops and random numbers
N	counter in FOR/NEXT loops
P	constant = 1
Q	constant = 22
V	volume (36878)
X	counter in FOR/NEXT loops and random numbers
Z	current location to be updated in subroutines 91–98
AA	skill level
A$	string for GET statements
CL	current location for treasure hunter's head
CM	difference between color memory and screen memory
CH-CI-CJ	address of screen locations for treasure chest
DF	dead flag
FG	flag for treasure chest already picked up
FL	flag for repeat stagger
GB	gold bars remaining
GC	gold coins remaining
RN	number of current round
SC	current score
SH	sound high (36876)
SL	sound low (36875)
SK	location of current active skull
S1–S5	locations of moving skulls
TB	random tab value for placing palm grove
TL	temporary storage for CL during update
TS	temporary storage for SK during update

A Change For Expanders

If you have a VIC, you must use a memory expander. The program was designed to run with any size memory expander, but to LOAD and RUN it on a VIC with an 8K or greater expander, a single-line keyboard entry must be made before LOADing the program. If you are using a 64 or a VIC with the 3K expander, you can skip over this part since the program will LOAD and RUN without special intervention.

When you add 8K or more to the VIC, screen and color memory and start of BASIC are moved to new memory locations. The idea is to put them back to their default locations before LOADing the program. Start of BASIC must be changed to address 8192, to prevent interference with screen memory. To set your VIC to run Treasure Hunt with the 8K expander in place, type the following line and press RETURN:

```
POKE648,30:SYS58648:POKE642,32:SYS58232
```

Your VIC will now load and run many programs written for the unexpanded or 3K-expanded VIC.

Typing In Treasure Hunt

The VIC version is about 6000 bytes long. *Don't add any spaces*; there are only 47 bytes free at some points during program execution.

If you do run out of memory, try deleting some of the instructions in lines 800–880. Make sure you SAVE the program before you run it. With such a long program, I usually save my work every half hour. If you don't want to type it in, I will make copies of the VIC version *only*. Send a tape, a self-addressed stamped mailer, and $3 to:

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See program listings on page 166.

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C. Regena

A Simplified Inventory

If you asked ten different programmers to write an inventory program, you'd probably get ten different approaches. There are many ways to accomplish such a task, depending on how much information you need to keep track of. This month, we'll take a simplified approach using DATA statements, and then we'll see how to customize the program.

This inventory program simply prints a list of items with a little information about each one, including its cost. After printing the list, the costs are added up. You can print the whole list, or you can print just a certain category. The amount of information you can store will depend on the capacity of your computer because all the information is stored right in the program in DATA statements.

The READ-DATA Connection

First let's review DATA statements, which are always associated with a READ statement. The READ statement picks up a number or string from the DATA statement and assigns it to a variable name. I like to think of the DATA-READ system as an alternative to the LET or direct definition system. One way of assigning values to variables is:

```
100 A=10
110 B=7
120 C=3
130 D=5
140 E=13
150 F=25
```

Another way is:

```
100 READ A,B,C,D,E,F
110 DATA 10,7,3,5,13,25
```

This second method may be harder to understand and harder to debug if there's a problem, but it usually saves memory and often simplifies programming.

In the second method, line 100 first says to read a number for A from the first DATA statement you come to. The value is 10, so A will equal 10. Next a value for B is read and assigned; B=7. The process continues. You need to make sure your numbers are in the right order in the DATA statement and that you have enough numbers to satisfy the READ statement. Your DATA statement may be as long as the longest line the computer allows (88 characters for the VIC, 80 for the 64). The READ statement reads only the numbers it needs and ignores the rest. If the computer encounters another READ statement later, the computer starts with the very next data item that hasn't been used.

Quite often you will see a READ statement in a loop:

```
100 FOR I=1 TO 4
110 READ NAME$,AGE
120 PRINT NAME$,AGE
130 NEXT I
140 DATA MARCIE,18,JEFFREY,16,BRIAN,11
150 DATA MIKE,13
```

The elements in the DATA statements need to be in the right order so the data is read correctly and in the right order, but the DATA statement lines can be placed anywhere in the program. Lines 140 and 150 above could be lines 90 and 95, for example. As the computer goes through the program, it ignores the DATA statements until it hits a READ statement. A pointer helps the computer keep track of where it is in the DATA statements, so it knows which is the next item to be read. In the sample above, the first time through the loop, line 110 will assign MARCIE to NAME$ and 18 to AGE. The next time through the loop, JEFFREY and 16 will be read, and so on. By the way, you have to be very careful typing the DATA statements so the values will match up with the READ statements. For example, if you skipped "16" in line 140 and just typed

```
140 DATA MARCIE,18,JEFFREY,BRIAN,11
```

the computer will stop with an error message be-

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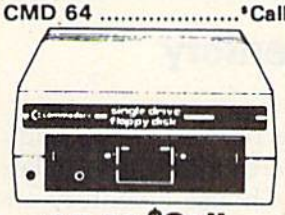

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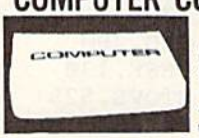

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cause it will try to read a numeric variable (AGE) in the second loop and get a string (BRIAN) instead.

You may divide up the DATA statements in any way that is convenient for you to type. Lines 140 and 150 above could be combined into one statement. Or you could end line 140 with BRIAN and start line 150 with 11. The main thing to remember is to keep the data items in order. If you have a full program, you can save some memory by typing as much as you can in each DATA statement, although it may be harder to understand.

Inventing An Inventory Program

In the previous example we printed names and ages. An inventory program can be very similar. Let's say we want to print a house inventory and list furniture and appliances and their costs. The READ statement reads ITEM$ and C for cost (you cannot use COST because that name contains the BASIC word COS for cosine). After you READ the information from data, you PRINT ITEM$,C and there is a list. The DATA statements would look like this:

```
320 DATA BED,200
330 DATA DESK,130
340 DATA STOVE,525
```

With the general idea of reading items from data and printing them, you can write a simplified inventory program. In the previous name and age sample, we used a loop and read four names and ages. In our inventory program we may not know how many items we have—or we may want to update our program periodically and not always have to figure out a new value for the FOR-NEXT loop. The solution is to have our last data item be a "dummy" item to signal the end.

```
100 READ ITEM$,C
110 IF ITEM$="ZZZ" THEN 500
120 PRINT ITEM$,C
130 GOTO 100
320 DATA BED,200
330 DATA DESK,130
340 DATA STOVE,525
350 DATA ZZZ,0
500 END
```

If you want to calculate a total cost as you are printing the list, initialize a total before line 100, say T, to be zero, then add line 125 T=T+C, and then at line 500 print the total cost T.

Add a title and make an attractive format, and you have an inventory program. You may want to add a few more columns in the program for other information, such as the date purchased and replacement value.

The "Household Inventory" program included here adds a code item—a room number or category—so that you can print out one room at a time or the whole list. First I numbered the rooms—I just used an example; you will need to adapt the list of rooms for your own house. Lines 20–50 READ from DATA the names of the rooms and assign the numbers. R$(1) will be the living room, R$(2) will be the kitchen, R$(3) will be bedrooms, and so forth for nine categories.

In each DATA statement I first put the room code, then the item, then the cost. For example, line 350 has room code 8, the item is a computer, and the cost is $300. The DATA statement is:

```
350 DATA 8,COMPUTER,300
```

Lines 470 and 480 list televisions: One is in the computer room (8) and the other is in the family room (6).

You can arrange the DATA statements the way you want. I considered how the list would look if I printed all the items, and I arranged the items alphabetically. You may prefer to list the items by room and perhaps by physical position in the room.

Lines 60–100 print a title screen and offer a choice of rooms or zero to print the complete list. Line 110 gets the user's choice. If the user presses 0, the whole list will be printed, but if a room number is chosen, only the items referenced by that code number will be printed. The logic for this selection is in lines 180–200. Line 170 READs the room code, the item, and the cost. The user's choice is A and is compared to the room code for printing. TT keeps track of the total cost. C$ and TAB (20 − LEN(C$)) are used to line up the numbers in the cost column.

An option to print a different list is presented in lines 270–300. When we print a list, the computer starts at the top of the DATA list and goes all the way through the list, so if we choose the option to print another list, we need to RESTORE the data. RESTORE says to start the data pointer back with the very first DATA statement. Remember that in this program we first read in the names of nine rooms using DATA statements, so to get down to the data for the inventory items, line 160 simply reads those first nine items. Line 170 will then read the next data from line 320.

I've included a few items so you can see how the DATA system works for an inventory list and how you can choose categories or room numbers. The very last data item is 10,ZZZ,0. Line 170 READs the room, item, and cost, so you have to have three things in each of your DATA statements. Line 180 says if ROOM=10 then branch to line 250. I'm using 10 as the end-of-

data code. As you update your program, simply add DATA statements wherever you want among the existing statements. If you want to keep the list in alphabetical order, find where the item belongs and use a line number in-between. Just make sure that the last DATA statement is 10,ZZZ,0.

Modifications

If you understand how to use DATA statements for this simple inventory, let's explore them further. The "Computer Inventory" program lists a sample of computer equipment. In addition to the item and the cost, I wanted to include the serial number and the date of purchase. This time you can select two codes. Instead of room numbers, the first code represents the kind of computer: 1 for Commodore, 2 for Radio Shack, and 3 for Texas Instruments.

Within each brand of computer are some more categories: 1 for computers, 2 for peripherals, and 3 for software. Instead of just the 3 for software you may want to have different categories for games, programming languages, educational programs, utilities, etc.

You may also want to print a list of all your Commodore computers. You could press 1 for Commodore and 1 for computers. Only those data items starting with 1,1 will be printed. If you want a list of all the Radio Shack equipment and software, first press 2 for Radio Shack then 0 for everything. For the complete list, the selections would be 0 for everything (all kinds of computers) and 0 for everything of the second choice.

The DATA statements contain the following information in order: type of computer: 1, 2, or 3; type of item: 1, 2, or 3; item name; serial number; date of purchase; and original cost. An example is:

```
390 DATA 1,2,DATASSETTE,282754,1982,70
```

This item comes under Commodore equipment, it is a peripheral called a DATASSETTE, the serial number is 282754, it was purchased in 1982, and it cost $70.

Notice that some of the data items do not have a serial number. You still need to list a data item in the DATA statement, but in this case simply type a comma following a comma. For example:

```
400 DATA 1,3,VICMON,,1982,60
```

We still have to have the right number of items in each DATA statement.

The very last DATA statement is 10,0,,,,0; again, it has to have the right number of items. We'll be checking for 10 and the code to indicate the end of data. It really doesn't matter what the rest of the DATA statement contains because we won't be using it, but we must include the right number of items to read.

The structure of this program is similar to Household Inventory. Lines 20–40 define the different categories and are used to print the titles of the lists selected. The selection process is done in two steps. First, lines 70–110 allow the user to select the kind of computer. Next, lines 120–160 allow the user to select the type of item. Line 190 prints the title of the list.

Line 200 RESTOREs the data so that each time a list is printed the computer starts at the top of the list of data items. Line 210 READs the two code numbers, then the item, serial number, date, and cost. Lines 220–260 determine if that is the last data item or if the item has the right code numbers for the category to be printed. Line 280 prints the item with its serial number, date, and cost. Lines 380–530 contain the sample data items.

Notice that this time the data items are not listed alphabetically by item. The list is arranged by computer, then within each type of computer category the computers are first, then the peripherals, then the software in alphabetical order. You may want to arrange your list differently—perhaps by date purchased, or perhaps in descending order of cost.

Customizing The Program

Again, you can adapt the DATA statements to your own needs. You may want to keep track of the date by month and year (such as 7/83) rather than just the year. You might want to list both the purchase price and a replacement cost. Or you might want to keep track of model numbers or catalog numbers. Perhaps you would also like to remember where the item was purchased.

If you have a printer, you might print out the information. (For a discussion on printouts, see last month's column.) Near the beginning of the program, use an OPEN statement to tell the computer to prepare for a printer. A statement such as OPEN 4,4 will open file 4 for the printer, which is device 4. Later in the program, use the regular PRINT statement to print something on the screen; but when you want to print on the printer use PRINT#4. Near the end of the program, when you're finished printing, you need to close the file. This can be done with PRINT#4:CLOSE4.

If you have a long list of items, you may want to add a section of code to prevent the list from scrolling off the top so you can't read it. There are several ways to do this. One is to use a line counter and increment the line counter each time a line is printed. When you have printed 20

or so lines, put in a delay loop or a routine to wait until the user presses a key before printing continues. Another method would be to use GET after each PRINT statement. If a key is pressed you temporarily stop the program until another key is pressed.

I didn't include any titles to the columns. For more readability, you should add column headings. You may need to adjust the printing—40 columns for the 64 and 22 columns for the VIC.

This DATA statement idea can be used for other types of lists as well. For example, you can keep a name and address file with this method. You can have several code columns—those who have a computer and those who don't; those who have children and those who don't; those who sent you Christmas greetings the previous year and those who didn't; business associates, neighbors, social friends, and relatives; and so forth. By the way, you don't have to use numbers for the codes. You could read C$ for code and read in B for business, N for neighbor, F for friend, and R for relative, for example.

Your DATA statement can contain several codes, then the name, address, phone, birthday, or whatever information you want to keep. You can arrange the list alphabetically by name, geographically, or however you wish. This DATA system is really quite versatile. Once you have your main program working properly it is fairly easy to update by simply adding DATA statements.

One thing you have to remember is to SAVE your work each time you update the DATA statements. If you don't, all of the changes you made will be lost when the computer is turned off.

You probably have your own ideas now about how you can use DATA statements to organize information.

See program listings on page 151.

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ROBERT SIMS, ASSISTANT EDITOR

The Electronic Café

Somewhere in New York there's a tablecloth with the bleached-out vestiges of poetic lines scrawled by Allen Ginsberg as he sat in a Greenwich Village cafe and argued with Jack Kerouac about the meaning of life.

As long as there have been cities, there have been inns, coffeehouses, and cafés where creative people congregated to pass the time and try out new ideas on old friends. And from all the chaos and seemingly rambling conversation in cafes in Vienna, Paris, Moscow, San Francisco, and Baghdad, have come many of the artistic movements and revolutions that have defined contemporary cultures.

Espresso And Computers

Telecommunications is beginning to play a role in this creative ferment. Originally conceived as a practical, if expensive, means by which business data could be transferred and manipulated over long distances, telecommunications is being transformed by a few innovative individuals and companies into a multifaceted creative and social tool for the home.

With the advent of home telecommunications, an artist's forum for the exchange of ideas no longer is confined to the neighborhood café. Given access to all the bulletin boards, newsletters, and conference lines on the information networks, a home computer owner becomes a patron in a vast electronic café in which time and distance no longer matter.

Computer owners can meet and talk in the same electronic café, regardless of whether they live in small towns or in major metropolitan areas. And the words which pass between them need not evaporate as they are spoken, as happens in an ordinary café.

In the electronic café, words have a life span. You no longer have to be sitting at the table to hear an interesting conversation. You can log on to a bulletin board and read the thoughts left there days or even weeks before. And you don't have to rely on your memory to recall some idea that excited your imagination. You can go back and read the words again, or even download them and make them a permanent part of your personal library.

A Writer's Bulletin Board

Home telecommunications is broadening artistic horizons in other, more practical, ways. For example, if you're a professional writer looking for new and different markets, there's a bulletin board in West Palm Beach, Florida, which serves just that function.

Called The Notebook, the bulletin board contains queries from publishers looking for articles on specific subjects, notices from writers who have articles or ideas to sell, and occasional tips on how to write and sell for the hottest markets, such as romance novels or fantasy.

You won't find any games or programs in the download section, and the bulletin board items are by and for professionals only. Callers have to pass the sysop's scrutiny before they are admitted, but, once approved, writers have one more resource in the struggle to make a living in a volatile field.

Electronic Publishing

It's not just in the exchange of ideas and information that the electronic café is serving artists. Literary, visual, and musical works are being published in these electronic media with increasing frequency.

On-line newsletters and special interest groups—such as the ARTSIG on CompuServe and Writer's Corner on Delphi—are offering artists a new way to get their work before the public.

Traditionally, this function of publishing and displaying the work of new writers and visual artists has been inadequately handled through small literary journals and storefront galleries. Financed on a shoestring, these enterprises have had very limited circulation and very short lives.

But the electronic café has hundreds of thousands of patrons, and the cost of publishing a work (apart from the initial cost of a computer and modem) is a matter of the time it takes to upload it. With no store rent to pay, no printers' costs, no problem trying to convince a distributor to handle a work by an unknown artist, the electronic café is a godsend to aspiring artists and publishers both.

A Wide-Open Market

Although the networks are adding services every day, the field is still wide open. An entrepreneur can found a publishing empire on-line with little more than a fresh idea and a user ID number. The procedure is simple. Just write up a proposal outlining your idea and goals for a special interest group or newsletter, and mail it (or Email it) to the Information Provider Department or Customer Services Department of your favorite network. If the network thinks your idea will appeal to a reasonably large group of subscribers (or potential subscribers), they'll send you guidelines and a contract, and you're in business.

It's even possible for the proprietors of these on-line publishing enterprises to count the number of times an article is accessed, and so pay a contributor royalties based on the number of users who read or view a work, instead of the usual method of paying a set amount for each story or article. In electronic publishing, an artist's monetary reward can be exactly proportional to his or her popularity.

An Uneven Advantage

Writers are more fortunate than visual artists and musicians, because they work with words, which can be transmitted in a form compatible with almost any computer. (Most home telecommunications services have been adapted from software written to transmit business documents.) But businesses have little need to transmit animated graphics and music, and business applications so far have defined the scope of telecommunications software.

This is because home telecommunications began as a "poor relation," as an afterthought. Some of the information networks like The Source and CompuServe, that were providing telecommunications services for business, saw a way to profitably use their computers from 6 p.m. to 6 a.m. when business traffic was at a virtual standstill.

Since their computers were sitting idle, the networks began to offer bulletin boards and conference lines to computer hobbyists. The response has been phenomenal, and growth has come so quickly that research can't keep pace. The numbers of new home telecommunications users can safely be measured in the thousands every month. As the income from home users grows to a more significant percentage of the networks' profits, we can expect to see software written specifically for games, entertainment, and the visual arts.

Until that happens, musicians and visual artists will not be able to fully use the electronic café for direct delivery of their work. They must depend on programmers to package their work within programs which must be downloaded and run off-line before the work can be enjoyed.

Artistic Bottlenecks

While current technology is capable of transmitting high-resolution screens and music, the lack of standards for different brands of computers makes the matter a practical impossibility. For example, the CompuServe Information Service offers color graphics to its subscribers, but, in designing a format which is compatible with all computers, the network's software fails to make use of the best graphics features of any. As a result, transmitted graphics are inferior to what owners are used to seeing on their screens.

The answer to this quality problem would be to write custom network software which could take advantage of each computer's special features. However, given the rampant changes in the home computer industry, no network is likely to invest the time and money necessary to fully exploit the features of a computer which may be out of production before the software is written.

Another bottleneck which hampers the growth of on-line art is transmission speed. Ordinary phone lines, over which most home telecommunications travel, do not transfer data reliably at transmission speeds greater than 1200 bits per second.

The most common transmission speed available to home users is 300 bits (roughly 30 characters) per second, which is slower than most printers in home computer systems.

At 30 characters per second, a VIC screen can be transmitted in 15–30 seconds, and for the 64, in 30 seconds to a full minute. And a detailed high-resolution screen takes eight times longer. Even at 1200 bps, graphics transmissions using ordinary phone lines are far too slow to appeal to

a generation brought up on the fast visual pace of television.

New Developments

Fortunately for computer artists, the broadcast media are interested in the home computer market. Whereas the information networks are primarily business-oriented, broadcasters deal in consumer entertainment, and so are possibly more sensitive to consumers' special needs. FM radio stations are experimenting with services which broadcast software, news, and games to home computer owners.

Also under development are systems which will allow television transmission of digital signals for computers simultaneously with "The A-Team." Other companies are trying cable hookups for computers, so that on channel 19 you get Home Box Office and on channel 18 you get a computer network like CompuServe, Delphi, or The Source.

With a much faster transmission speed and a predisposition toward the consumer, the broadcast media may well replace phone-based services as the primary resources for home telecommunications.

But whenever and however the shakeout comes, consumers are sure to be well-served. After all, the home computer industry was born when a few legendary hobbyists in a few legendary garages decided to transform a dull and mysterious business machine—the computer—into an exciting and entertaining personal tool.

If a few hackers in garages can create a billion-dollar industry in their spare time, then giving them access to continental communications networks should yield even more astonishing results.

If you have questions or ideas about subjects you'd like to see covered in this column, write to: Home Telecommunications, COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403. Or you can send me electronic mail. My CompuServe ID is 75005,1553. For Delphi, it's BOZART.*

The Notebook
West Palm Beach, Florida
J.D. Pitt and Karl Meyer, Sysops
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User Group Update

When writing to a user group for information, please remember to include a self-addressed, stamped envelope. Send additions, corrections, and deletions for this list to:

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MACHINE LANGUAGE FOR BEGINNERS

Richard Mansfield, Senior Editor

First Questions

Although the difficulty of learning and programming machine language (ML) is often exaggerated, there *are* some confusing things about it when you first try to understand it. This month let's answer some of the basic questions, some of the questions which everyone seems to have when they first dare to leave BASIC.

What exactly is *assembling*? How is an ML program written?

Just as a BASIC program is written under the control and with the assistance of the BASIC language, an ML program is written with an *assembler*. BASIC comes with the VIC and 64. It's sitting in ROM memory and available whenever you turn on the machine. An assembler, however, must be loaded in from disk or tape, or plugged in as a cartridge. An assembler is a program and can be written in either BASIC or machine language.

Perhaps the main reason that ML has a reputation for being difficult to write is the poor quality of many commercially available assemblers. They are often slow or awkward to use. Many have few error messages, limited features, or cumbersome editing features.

When you are first learning ML, you'll be writing short, simple programs. For that, a simple assembler written in BASIC can suffice. But when you progress to more sophisticated programming, you'll want as comfortable a programming environment as you can get.

An ML program is usually written as *source code*. You write instructions much the way a BASIC program is written:

```
10 LDA #65;     LOAD THE ASCII CODE FOR
                THE LETTER "A"
20 STA $0400;   STORE IT ON SCREEN
30 RTS;         RETURN TO BASIC
```

The best assemblers allow you to write this source code exactly the way you write your BASIC programs—with line numbers, with the normal Commodore full-screen editing features, with remarks, multiple-statement lines (divided by colons), etc. Writing ML in this way has the added benefit that all your BASIC programming aids will work. You can use automatic line numbering, search and replace, mass line deletion, renumbering, and so forth.

When you want to try out your source code, you tell the assembler to assemble it. The assembler will then turn all your commands (like LDA #65) into numbers that the 6502 can execute as an ML program. While it's assembling, the assembler should point out any errors you might have made and print the line where the error occurred. It should also provide you the option of having the results of the assembly (called *object code*) POKEd into RAM for testing, SAVEd to tape or disk, and printed on screen and a printer. You should also be able to turn these options on and off at will.

After the source code has been assembled into object code, it is a finished ML program. If you assembled it to disk, you can load it in and SYS to its starting address. If you assembled directly into RAM, just SYS and test it right after assembly.

How long does assembly take?

Speed is also an essential quality of a good assembler. This is because you'll want to write sophisticated programs—perhaps an all-ML arcade game—and you'll need to reassemble every time you make some adjustments. If your assembler takes 15 minutes to assemble 5K, that will become a significant burden. You'll find yourself

trying to debug the program in your head, trying to figure out a cure by staring at the source code rather than testing reassembled object code. If you have to wait a long time for every assembly, your programming style will become distorted as you do everything possible to avoid another long wait.

How fast is fast enough? The best disk based assemblers will do roughly 1K a minute. This is about the fastest that assembly can be accomplished on larger ML programs because it's the speed at which a disk drive will deliver source code to an assembler. Larger programs are generally written in sections, each section then saved to disk and linked to the next file by an assembler command as the last instruction in the file. Composing programs of these linked modules is an efficient way to divide a complex job into manageable tasks.

RAM, too, can be too small to contain all the source code at once. Heavily commented source code can take up much more memory than its assembled object code. Here's a commented line of source code:

```
100 INY; RAISE THE COUNTER UNTIL IT
    REACHES 45
```

As source code, this line takes up 46 bytes. When assembled, the INY will be translated into the number 200. So, the object code for this line, the number 200, will be stored in one byte.

What do you do with an ML program after you assemble it? RUN? SYS?

BASIC programs are always located at the same place in a computer's memory, so there is a predictable starting address. The BASIC command RUN knows right where to go to find the first instruction in a BASIC program. RUN doesn't need an *argument* (a number or address following the command). You never need to specify where the RUN should start. You never need to say RUN 1024.

But ML programs can be located anywhere you want to put them. You can make them reside wherever you've got some free RAM. That's why an assembler will always want to know what starting address you've chosen. For example:

```
10 *= 12000
```

might be the first line of an ML program, the *= symbol signifying that address 12000 will be where the ML program begins. After it's assembled and is sitting in RAM from address 12000 on up in memory, you must SYS to execute the program. In this case, a SYS 12000 will turn control of the computer over to your ML program.

There is an ML instruction, RTS, which will return you to the normal BASIC environment after your ML program is finished.

How do you pass a number from ML to BASIC?

Just before you RTS back to BASIC, store the number (if it's less than 256) in address 251. Larger numbers are stored in ML by using additional bytes, as multiples of 256. So, you could use address 252 to hold a multiplier. For example, if you wanted to store 1024, you would stick a 4 into 252 and a 0 into 251. To store 1025, put 4 into 252 and 1 into 251.

Then, when you return to BASIC, you can get the number into a BASIC variable in this way:

```
10 X = PEEK (251) + PEEK (252) * 256
```

You can use address 251 and 252 for this since the computer leaves those addresses alone. Any address between 251–254 is safe to use. You can also use addresses 163–177 and 828–1019. In fact, if you know where your BASIC program ends and where your ML program resides, you could use any unused RAM to pass messages between BASIC and ML. You just want to avoid storing things on top of the resident programs.

There are other ways to pass numbers, but this is an easy and effective method.

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IF-THEN, Logic, And Flags

John Michael Lane

If you've discovered a clever timesaving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot always reply individually to submissions.

If it weren't for the IF-THEN statement, BASIC would be like a highway with no exit or entrance ramps. You could travel only one direction, from the beginning of the program to the end. IF-THEN, like its cousin ON-GOTO, is a decision-maker, a fork in the road. The ability to make logical decisions is what gives BASIC much of its programming power. It allows you to build entrance and exit ramps wherever you wish.

Truth And Falsity

Have you ever wondered what happens when your computer executes an IF-THEN statement? For example,

```
100 IF A=7 THEN B=C+5
```

In ordinary English, we'd say something like, "If A is seven then we'll make B equal to C plus five."

When your Commodore 64 or VIC-20 runs into an IF (condition) THEN (action) statement, it does something similar. It first checks the condition (Is A=7 true?). If it is true, it takes the action (make B=C+5). Otherwise, it goes to the next program line, skipping over anything else on the current line.

The letter A in the example above is a numeric variable, which acts as a number when you add, subtract, or do any other mathematical operations. But when you put an equals sign and another variable or number after it, the whole thing becomes an expression (A=7). When necessary, the BASIC interpreter evaluates these expressions and decides if they are true or false.

It may seem to be a simple task, figuring out if A=7, but BASIC has to be ready for almost anything. An IF expression may contain floating point, integer, or string variables. It can contain logical operators (NOT, AND, OR). There might be parentheses, to signal the order of evaluation. And any extra spaces have to be ignored, unless they are inside quotation marks.

Once the expression has been evaluated, a number is returned to the IF-THEN part of BASIC. If the expression is false, the number returned is zero. If it's true, the result is negative one (−1). It's not coincidental that the REMark section of the interpreter follows IF-THEN. When a false expression is found, your computer drops into REM mode, ignoring anything after the THEN, and looks for the next line of real BASIC.

To see how this logic works, enter the following line:

```
Q=9:PRINT "Q=9":PRINT Q=9
```

Your computer should respond by printing the string (Q=9), followed by a −1 (which means the expression is true, because you assigned the value of nine to the variable Q). If you try to PRINT Q=15, you should see a zero

(because the expression is false).

The three equals signs do three completely different things in the line above. The first one is an assignment-equals. It assigns the value of nine to the variable Q. You could also say LET Q=9, although LET is optional; it's rarely used anymore. After the PRINT, it's inside quotation marks and is simply a character-equals. The final time it is a comparison-equals, used to compare the numbers or variables on either side.

The difference between assignment and comparison is illustrated in this unusual-looking line:

```
R=5:S=R=5:PRINT S
```

First, we assign five to variable R. Next, the computer wants to assign a value to S. It decides that R=5 is an expression and does an evaluation (using a comparison-equals). The expression is true, which gives a value of minus one. That value is assigned to S, and a −1 is printed on the screen.

The greater-than (>) and less-than (<) symbols are also valid within an evaluation, although they cannot be used to assign values. LET A<9 doesn't make much sense, anyway; how would you assign a range of numbers to a single variable?

Why Minus One?

It's not hard to understand that zero means false. But why minus one for true? Why not ten, or one-half, or sixteen million?

Actually, you can use any number (except zero) to signal a true expression. It is fairly common to use a statement like this in a program:

```
10 IF A<>0 THEN PRINT "MESSAGE"
```

Knowing that zero always turns out to be false, and nonzero numbers are evaluated as nonfalse, you can make a modification to the above line. You want to find out if A is not equal to zero. Another way of interpreting it is, if A is not false (in other words, if A is true) then print the message. You can substitute this:

```
10 IF A THEN PRINT "MESSAGE"
```

Leaving off the <>0 saves some memory, and can be a valuable programming technique. You just have to remember that zero means false, and anything else counts as true.

What is a variable and what is an expression? In the example above, the variable A is evaluated for truth or falsity as if it were an expression. To turn it around the other way, you can use an expression as if it were a variable. If false, the expression is equivalent to a zero. If true, it's equivalent to minus one.

Let's say your bank charges a fee of 15 cents per check when your balance falls below $400. Otherwise, checks are free. In your checkbook balancing program, you might have these two lines:

```
130 BAL=BAL-CHK
132 IF BAL<400 THEN BAL=BAL-.15
```

You input the check's amount, and the program subtracts it from the balance and checks if the new balance is below $400 and subtracts the fee if necessary. Now look at this variation:

```
130 BAL = BAL-CHK +(BAL<400)*.15
```

First the check is subtracted from the old balance. Next, the expression BAL<400 is evaluated. If the balance is $400 or more, the expression is false, giving you a zero. Zero times 15 cents is zero and the new balance remains as is. But if the balance is below $400, the expression is true and fifteen cents is subtracted (or more accurately, minus fifteen is added).

But do you notice the bug in this line? The balance which is compared to $400 is the old balance. The bank will be looking at the new balance. To fix this, change the line to read:

```
130 BAL = BAL-CHK +((BAL-CHK)<400)*.15
```

We still haven't seen why a true statement is worth minus one.

For one thing, it makes certain situations work out nicely. Like subtracting fifteen cents when your balance goes below $400.

Specifically, however, in twos complement arithmetic, minus one is the logical opposite of zero. At the bit level, you flip the bits and add one. In BASIC, this is the equivalent of adding one and changing the sign. Ask your computer to PRINT NOT 8. You should see a −9 on the screen.

An interesting corollary to this is that if you are using a logical AND as a mask, zero masks everything and negative one masks nothing. In other words, for any number X, X AND 0 always result in zero, while X AND −1 always return X. It's similar to multiplication, where zero times any number yields zero, and one times any number gives back the number.

Waving A Logical Flag

Knowing how to use variables as expressions (IF A THEN xxx) and how to use expressions as variables (A = (B<15)*2) offers a lot of flexibility in BASIC programming.

Flags, for example, can be useful in almost any type of program. When you first type RUN, all variables are set to zero. So, if you have a variable called FLAG, you know it starts out being false. The flag is down. By assigning a value to FLAG, it is set, and you test it with a simple IF FLAG THEN (action), rather than the bulkier IF FLAG <> 0 THEN (action).

Disk Tricks

Gerald E. Sanders

Many operations with your 1540 or 1541 disk drive can be tedious and difficult. This article discusses how your drive works and then demonstrates some nifty tricks to help you get the most out of it. Included are programs which allow you to change a disk name, change a disk ID, unscratch, and scratch disk files.

Have you ever needed to unscratch a program or file on a Commodore 1540/1541 disk? Did you ever want to rename an old disk or give it a new disk ID without erasing the other files? Have you ever saved a program to disk and then seen a funny-looking title when you listed the directory? Or found you couldn't determine the right combination of characters to scratch the unwanted file? And then, did you search the disk manual in vain to find the commands to rescue you from your predicament?

While there are no neat, one-word commands to solve these types of problems, all the necessary information is there in the manual, although it's somewhat scattered and cryptic. All that's really necessary to do some effective tricks with disks is a rudimentary knowledge of the hexadecimal number system, the disk drive manual, a chart of ASCII (CHR$) codes, and the "Display T&S" program from the *TEST/DEMO DISK* which comes with the drive.

DOS Knows Where To Look

The 1540 and 1541 are called intelligent devices because each has its own microprocessor, RAM, and ROM. Like the VIC and 64, the drives contain an *operating system* program in ROM. For the drives the program is called, simply enough, the *disk operating system*, or DOS for short. The DOS controls all the operations of the drive.

To understand the operation of the drives, we first need to understand how the DOS knows where to look for a particular program. Data is stored on the disk in a series of concentric circular paths called *tracks*. These tracks are referred to by number, starting with track 1 at the outside edge of the disk, to track 35 near the inside edge. The tracks are further subdivided into *sectors*, or areas for storage. Sectors are synonymous with *blocks*, which you see on the left when you list a directory. Each sector can store 256 characters, or bytes, of data. A track can have 17–21 sectors, with tracks near the outside of the disk having the most sectors and tracks near the inside of the disk the fewest.

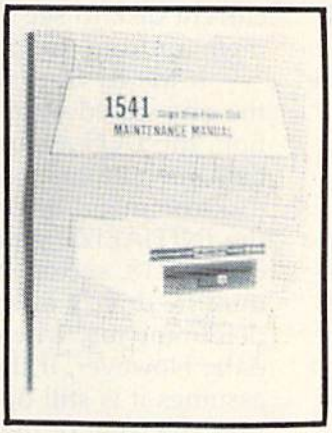
DOS reserves all of track 18 (the center track) to scribble notes to itself. Track 18 consists of 19 sectors (numbered 0–18), but let's look at the really significant sections of this track.

Sector 0 of this track contains the Block Availability Map, or BAM, which the DOS uses to keep track of the status of all the other sectors. Among other things stored in that sector are the 16-character disk name and the 2-character disk ID. These are stored in bytes 144–159 and bytes 162–163, respectively, as a series of binary numbers. Each number corresponds to the ASCII (CHR$) value of a character of the name or ID. If the name you gave the disk when it was formatted was shorter than 16 characters, the DOS added shifted spaces, CHR$(160), to get the total to 16. If your name was longer than 16 characters, it was truncated after the 16th one.

To see this, LOAD and RUN the Display T&S program from the *TEST/DEMO* disk. (For the VIC, this program requires at least 8K of memory expansion.) The program will ask if you

GOSUB

How to do your own maintenance, troubleshooting, schematics, theory of operation, cleaning hints, conversion from one power source to another and calibration. These topics and many more will make this manual a valued addition to your reference shelf. Whether you are an amateur electronics technician or a seasoned professional, you will be able to realize the full potential of your VIC-1541 by using this manual. Step-by-step instructions will lead you through the proper methods to get your VIC-1541 up and going in a hurry. The manual is 170 pages long, has two foldouts and over 100 illustrations, including:



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With all these illustrations and the detailed theory for each circuit involved, along with step-by-step procedures to follow, the manual is a great time and money saver.

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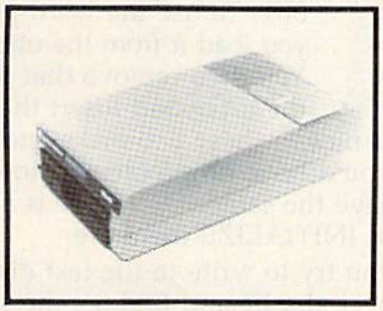

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want results printed to the screen or printer. Although printing to the screen works fine for most needs, sending the results to the printer makes studying the process much easier.

The program then asks you to enter a track and sector number. Enter 18 for the track and 0 for the sector, and the program will begin to dump the contents of that sector to the chosen device. If dumped to the screen, the display will scroll. To slow down the scrolling, hold down the CTRL key. Pressing RUN/STOP will stop the dump, but it will also take you out of the program and you'll have to start all over to get the complete dump.

The contents of the sector (see the accompanying figure) are displayed as hexadecimal (hex) numbers, a common way of representing binary values. If you're not yet familiar with the hexadecimal numbering system, see "Hexed By Numbers," which accompanies this article. Hex numbers are usually prefixed with a dollar sign ($) to distinguish them from decimal numbers, but dollar signs aren't used in the dumps.

```
TRACK 18  SECTOR 0

00 :12 01 41 00 15 FF FF 1F 15 FF FF 1F 15 FF FF 1F :  A  ππ  ππ  ππ
10 :15 FF FF 1F 15 FF FF 1F 15 FF FF 1F 15 FF FF 1F : ππ  ππ  ππ  ππ
20 :15 FF FF 1F 15 FF FF 1F 15 FF FF 1F 14 FF FE 1F : ππ  ππ  ππ  π■
30 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
40 :00 00 00 00 00 00 00 00 0E 6C FB 07 00 00 00 00 :          └▬
50 :00 00 00 00 00 00 00 00 00 00 00 00 0A 3E FB 00 :             >▬
60 :13 FF FF 07 0D CF 3D 03 02 80 01 00 00 00 00 00 : ππ  ┌≈  ▀
70 :04 B0 03 02 12 FF FF 03 12 FF FF 03 11 FF FF 01 : ▀  ππ  ππ  ππ  ππ
80 :11 FF FF 01 11 FF FF 01 11 FF FF 01 11 FF FF 01 : ππ  ππ  ππ  ππ  ππ
90 :55 54 49 4C 49 54 49 45 53 20 30 30 31 A0 A0 A0 :UTILITIES 001
A0 :A0 A0 41 43 A0 32 41 A0 A0 A0 A0 00 00 00 00 00 :  AC 2A
B0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
C0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
D0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
E0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
F0 :00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 :
```

Printed to the right of each line of the dump is the ASCII equivalent of the characters in that line. Here you'll see both graphics symbols and alphanumeric characters. The first two bytes of any block (sector) tell DOS where to look for the next block to read. On track 18, sector 0, these bytes should always be $12 (18) and $01 (1) to direct DOS to find the disk directory beginning at track 18, sector 1.

Name And ID

Continuing into the last 128 bytes (beginning at hex $80) of track 18, sector 0, we find other important information. Bytes 144–159 ($90–9F) hold the name we gave the disk when it was formatted. If the title contained less than 16 characters, you'll see shifted spaces, $A0, filling in the remaining characters. At bytes 162 and 163 ($A2 and $A3), you'll see the two alphanumeric characters used as the disk ID. The disk name is for your convenience and is not used by the DOS, unlike the ID, which is extremely important to the DOS.

After any read or write operation, including a SAVE or LOAD, the DOS places the current disk ID in the working storage area of its built-in memory. Whenever a new write command is sent to the drive, the DOS checks the ID on the current disk to see if it is the same as the one in memory from the previous operation.

If the ID from the current disk doesn't match the one stored in memory from the last operation, the DOS assumes it is working with a new disk and automatically executes an INITIALIZE disk command before it stores the data. During the INITIALIZE process, the BAM (bytes 4–143 of track 18, sector 0) of the new disk is loaded into the drive's internal memory so DOS can determine just where on the new disk it can put data. However, if the ID is the same, the DOS assumes it is still operating on the same disk and uses the copy of the BAM currently stored in its memory to determine which blocks are available to store the incoming data. This is part of the intelligence of the drive, but it works correctly only if you understand the process, and take advantage of it by giving every disk a unique ID.

Suppose you've saved a word processing program on a disk titled UTILITIES 001, and you store the text files you create with this word processor on another disk called TEXT FILES 001. To use the word processor, you load it from the utilities disk. You then remove that disk from the drive and insert the disk with the text files. If these two disks had different IDs, you'd have no problems. However, since they have the same ID, trouble is ahead if you forgot to INITIALIZE the drive.

When you try to write to the text disk, the DOS will check the ID and find it's the same as the one currently in its memory. Since the IDs are the same, the DOS thinks it is dealing with the same disk. It will use the BAM currently in memory to determine which blocks are available for text storage. As a result, DOS is likely to overwrite some or all of your text files, irretrievably destroying that data. Unique disk IDs prevent this kind of mistake.

Using all possible combinations of the letters A–Z and numbers 0–9 in a systematic way will give you 1,296 possible combinations. I started mine at AA and will go to AZ, then A0 to A9, then start over with BA. This works well, since Commodore's *TEST/DEMO DISK* has an ID of

ZZ. You can also use the graphics characters available when you press SHIFT or the Commodore key, which gives you an even greater number of possibilities.

Handling Files

The remaining sectors of track 18 list the programs by name and indicate where they are located. Use the Display T&S program to dump the contents of track 18, sector 1, the first block of the directory. Here's an example arrangement of a directory sector.

```
TRACK 18  SECTOR 1

00 :12 04 82 14 01 54 45 53 54 43 41 52 44 A0 A0 A0 :  ■■ TESTCARD
10 :A0 A0 A0 A0 A0 00 00 00 00 00 00 00 00 00 07 00 :
20 :00 00 82 11 01 44 49 53 50 4C 41 59 20 54 26 53 :  ■■ DISPLAY T&S
30 :A0 A0 A0 A0 A0 00 00 00 00 00 00 00 00 00 0E 00 :
40 :00 00 82 19 04 56 49 43 20 57 45 44 47 45 A0 A0 :  ■■ VIC WEDGE
50 :A0 A0 A0 A0 A0 00 00 00 00 00 00 00 00 00 04 00 :
60 :00 00 82 11 06 48 4F 4D 45 20 49 4E 56 20 31 20 :  ■■ HOME INV 1
70 :54 41 50 45 A0 00 00 00 00 00 00 00 00 00 09 00 :TAPE
80 :00 00 82 13 00 48 4F 4D 45 20 49 4E 56 20 31 20 :  ■■ HOME INV 1
90 :44 49 53 4B A0 00 00 00 00 00 00 00 00 00 09 00 :DISK
A0 :00 00 82 13 05 48 4F 4D 45 20 49 4E 56 20 32 20 :  ■■ HOME INV 2
B0 :54 41 50 45 A0 00 00 00 00 00 00 00 00 00 09 00 :TAPE
C0 :00 00 82 13 0E 48 4F 4D 45 20 49 4E 56 20 32 20 :  ■■ HOME INV 2
D0 :44 49 53 4B A0 00 00 00 00 00 00 00 00 00 0A 00 :DISK
E0 :00 00 82 10 00 53 50 45 45 44 54 59 50 45 A0 A0 :  ■■ SPEEDTYPE
F0 :A0 A0 A0 A0 A0 00 00 00 00 00 00 00 00 00 0D 00 :
```

As with track 18, sector 0, the first two bytes of the block point to the next block to be read. Notice that the directory does not use the sectors of track 18 sequentially. The first two bytes are $12 and $04, indicating that track 18, sector 4 is the next directory block. This staggered arrangement allows the drive to read the directory more swiftly. The last block of the directory will have $00 as the first byte in the block. Since there is no track 0 on the disk, this signals DOS that the end of the directory has been reached, and no more directory blocks will be read.

DOS scans the next byte to determine if the directory entry is valid, and if so, what kind of file the entry is. An $81 indicates a sequential (SEQ) data file, while $82, $83, $84 indicate program (PRG), user (USR), and relative (REL) files, respectively. A value of $80 or less signals a deleted or improperly closed file, and the DOS will treat this entry as if it doesn't exist.

Each directory sector can hold information on eight files. The other entries start at bytes 34, 66, 98, 130, 162, 194, and 226 ($22, $42, $62, $82, $A2, $C2, and $E2) in the block. In the previous figure, all these bytes are $82, so all the files in the example sector are programs. Storing eight entries per block in each of the 18 directory sectors allows a maximum of 144 entries in the directory.

The next two bytes (the fourth and fifth) tell the DOS where to look for this file. These two numbers give the track and sector of the first data block of the file. For the first entry in the previous figure, these bytes are $14 and $01, so the first file in the example directory, TESTCARD, is stored on the disk beginning at track 20, sector 1. The first two bytes of that block will, in turn, point to the second data block, and so on. As with the directory sectors, the file will be stored in staggered rather than sequentially numbered sectors, and the last block in the file will have $00 as the first byte of the sector.

Occasionally, these pointers may be disturbed, by turning off the drive while a disk is still inside, for example, resulting in spurious data being written to the disk. Knowing how the DOS finds its way around the disk, you may be able to locate and relink the program, thereby saving a precious original which otherwise might be lost forever.

The next 16 bytes of each directory entry contain the characters for the name of the file, padded with shifted spaces ($A0) if the name is less than 16 characters. The rest of the information contained in the directory entry is important for other applications, but space limits a full discussion.

Altering Disk Tracks

Now that we know how and where all the important information is stored, we can begin to perform the tricks mentioned earlier. Program 1, "Change Disk Name," allows you to change the name of a disk without erasing the disk as a NEW command will. Program 2 changes the disk ID without affecting disk contents. Program 3 helps you recover any previously scratched files, provided the DOS has not already overwritten them with another file. This program is 100% effective if used immediately after an erroneous SCRATCH command, but the likelihood of success diminishes rapidly as the number of files written to the disk after the SCRATCH increases.

When a file is scratched, the DOS updates the BAM to show that the blocks which were previously allocated to that file are now free to be overwritten. With luck, those blocks will not be used for some time; without luck, the next write may destroy part or all of the old file. And, finally, Program 4 allows you to scratch a file which cannot be deleted from BASIC. You have the option of permanently scratching the file and dropping it from the disk directory, or deleting the file, but leaving the name listed on the directory.

Hexed By Numbers

J. Blake Lambert, Assistant Editor

Reading and writing bytes, and directly modifying disk tracks and sectors is something like PEEKing and POKEing memory locations. You are advancing beyond simple BASIC programs into the realm of machine language. Sooner or later, you face the challenge of learning new, more convenient, numbering systems. Since computers only understand binary (base two) numbers and most people understand decimal (base ten) numbers, it's advantageous to learn how to translate from one to the other. To understand these number systems, let's think a minute about our normal counting method.

Our decimal (base ten) system evolved simply because humans have ten fingers. When we count in decimal, we start with zero and add ones until we get to nine, at which point we're out of numbers. To get to ten, we place a zero in the "ones" column and add a new column to the left, called the "tens" column. The next column to the left is named "hundreds," which is ten times ten (or 10↑2).

Binary counting is the same, but we run out of digits faster, because the computer has only two "fingers." That is, the electronic "switches" with which it counts are either off (0) or on (1). We count zero then one, and that's it. We start a new column called "twos," place a one in it, and clear the "ones" column. The next number is 11 and we're out of digits again. The "fours" column is created (two times two, or 2↑2), and we have the number 100, then 101, 110, 111 and 1000 (which equals eight in decimal, 2↑3). The problem with binary is that it takes too much room to write even small numbers. For example, the decimal number 255 written in binary is 11111111.

It requires 16 ones and zeros to describe a memory location on a VIC or 64. (Decimal 49152 translates to the unwieldy binary number 1100000000000000.) This is why hexadecimal, called hex by most computerists, is useful.

Hex is a simple shorthand for binary, but it requires learning a few new numbers. Just as the decimal number system has ten digits available (0 through 9), hex requires 16. These 16 digits are 0 through 9, then A, B, C, D, E, F. After counting to $F (the dollar sign represents "hex," the F stands for decimal 15), we next count $10, by placing a one in the "sixteens" column. The hex number $FF in decimal, then, equals 15 times 16, plus 15. Conveniently, this turns out to be decimal 255, so the eight-column binary representation (1111 1111) can be written using just two hex numerals ($FF). It's much easier to remember shorter numbers, so hex is usually preferred.

Here's a counting table that should help you understand how the systems work.

Binary	Decimal	Hexadecimal
0	0	$0
1	1	$1
10	2	$2
11	3	$3
100	4	$4
101	5	$5
110	6	$6
111	7	$7
1000	8	$8
1001	9	$9
1010	10	$A
1011	11	$B
1100	12	$C
1101	13	$D
1110	14	$E
1111	15	$F
10000	16	$10

These programs operate directly on data stored on the disk. They can do no permanent harm to the drive, DOS, or the disk itself; but, if the programs are not typed in carefully, they may destroy data stored on the disk. Such damage is usually repairable if you make a printout of the block on which you are working before you make any changes. If necessary, you can use these techniques to completely rewrite an entire block; I've done it before. But some mistakes can't be corrected, especially errors created on track 18, sector 0.

You don't have to understand how these programs work to use them, but let's look at a brief explanation. The computer sends information to the drive as fast as the drive can accept it. This means the computer may send one or two characters at a time, or it may send several thousand, depending on the situation. However, the DOS writes information to the disk only in whole 256-byte blocks. This means the drive must store incoming information in a buffer. The DOS maintains eight buffers in its built-in RAM. You can read a sector from the disk into a buffer

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using the block read (U1) command (see line 1050 of Program 1), and you can write the contents of the buffer back to the disk with the block write (U2) command (line 1080).

For a direct access operation, you gain access to a buffer by adding "#" after the OPEN statement for the data channel (see line 1040 of Program 1). The DOS will keep track of which buffer to use. Once a direct access channel is open to the disk, you can directly manipulate the contents of the buffer. Data may be read from or written to any byte of the buffer. The key to selecting a particular byte is the buffer pointer (B–P) command (line 1060). By setting the buffer pointer to the byte you wish to change, or the starting byte of a series, you can determine where in the buffer the PRINT# statement will place the data.

The programs are written so that they may be used alone. However, they will be much more useful if appended to the Display T&S program. If you chose to do this, simply remove the REM that begins the first and last line of each program (just the first occurrence of the word REM, not the whole line). The special features can then be accessed by RUN *xxxx* or GOTO *xxxx*, where *xxxx* is the second line of the appended program. For example, RUN 1000 would start the change disk name feature, and GOTO 3000 would start the unscratch feature. The programs are numbered so that you can add all four together to the Display T&S program to provide a versatile disk editing program.

Programs 3 and 4 require that you know the number of the byte where the directory entry starts. You can obtain the address of the target byte using the DISPLAY T&S program, convert that hex value into the correct decimal value, and supply this to the programs whenever they prompt for a buffer pointer value.

See program listings on page 149.

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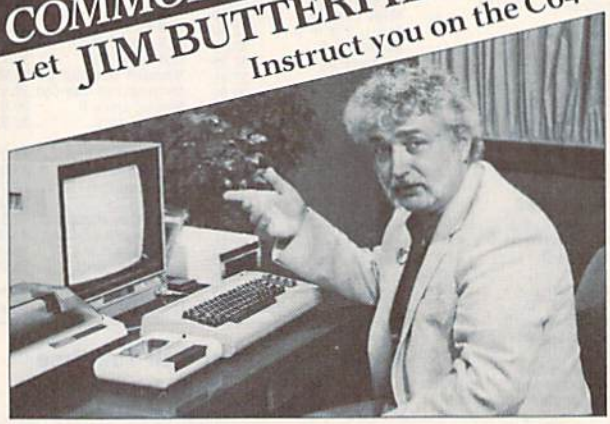

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Simulating Hi-Res Animation Part 1

The VIC-20 offers a lot of computing power for a very low cost. A major limitation, however, is its small amount of memory, only 3.5K (3583) bytes.

If you've ever tried to program hi-resolution graphics on the unexpanded VIC, you know just how restrictive this lack of memory can be. For example, setting up the entire screen for hi-res graphics on the VIC uses 4048 bytes, more memory than is available.

You can program a small hi-res "window" in the middle of the screen. The one recommended by the *Programmer's Reference Guide* is 64 × 64 pixels, and uses only 512 bytes. But this window is small, only 8 characters wide. So what do you do if you want smooth animation on the entire screen, and all you have is 3.5K?

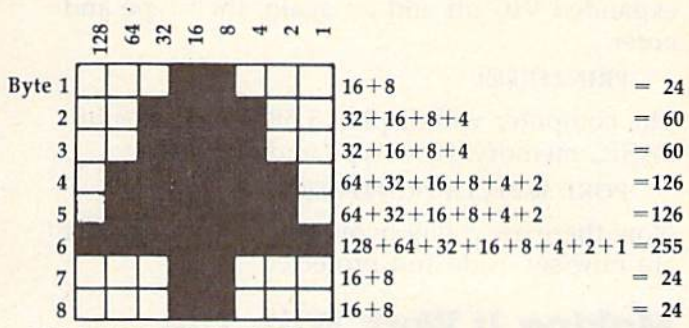
With custom characters, you can simulate hi-res animation. This simulation technique has an additional benefit: You can write your program in BASIC. Not that you can't program hi-res using BASIC. It's just that true hi-resolution animation should be programmed in machine language because it can be excruciatingly slow in BASIC.

Creating Custom Characters

With the VIC, you can redefine any character in the standard character set to display anything from a happy face to a flying saucer. Try this program, which changes the letter A to a pine tree.

```
10 POKE56,28:CLR:POKE36869,255:PRINT"
   {CLR}A"
20 FORA=7176TO7183:READB:POKEA,B:NEXT
30 DATA 24,60,60,126,126,255,24,24
40 GETA$:IFA$=""THEN40
```

Graphics characters in the VIC are composed of little dots (pixels) on an 8 × 8 grid. Each pixel is like a light switch—it's either on or off. When a pixel is on, it prints on the monitor screen as a dot. When it's off, it's blank. Characters are created by turning on and off various pixels to form a pattern:



DATA FOR PINE TREE IS:
24,60,60,126,126,255,24,24

Pine tree custom character as depicted on an 8 × 8 grid. Shaded areas are pixels that are turned on.

The data for each 8 × 8 grid is stored in eight bytes, each one corresponding to one of the horizontal rows on the grid. The bytes are consecutive, byte 1 corresponding to row 1 of the grid, byte 2 to row 2, and so on. Each of the eight bits in a byte corresponds to one of the eight vertical columns on the grid.

The value of each of the eight bytes is determined by which pixels are on. The values of the "on" pixels are then added together.

As an example, look at the first byte (row 1) in the figure. The pixels that are turned on correspond to the bit positions with the respective values of 16 and 8. So the total value of the first byte is 16 + 8 = 24. Using this formula to tally the totals for each of the eight bytes of the pine tree character, we get bytes with the values of 24, 60, 60, 126, 126, 255, 24, and 24.

A Safe Location

The data for the standard VIC character set can be found in a 4K block of memory in locations 32768 to 36863. Because this area of memory is ROM (Read Only Memory), you cannot POKE new values here to create the custom character set. The character set has to be moved to an area of RAM where the new values can be placed. A safe area in the unexpanded VIC is locations 7168–7679, the top of BASIC memory.

The first thing to do is to protect the character data so it cannot be overwritten by BASIC. This can be done with POKEs to locations 55 and 56, which point to the *top of BASIC memory.* Moving the top of memory down two pages (a page is 256 bytes), will reserve 512 bytes for the custom characters. This will be enough for 64 characters, because a complete character needs eight bytes. The normal value of byte 56 in the

unexpanded VIC is 30. So to set the custom character memory aside, POKE 56,28 then type and enter the BASIC command CLR (not the CLR/HOME key).

To see this demonstrated, turn your unexpanded VIC off and on again, then type and enter:

```
PRINTFRE(0)
```

The computer will display 3,581 free bytes of BASIC memory. Now type and enter:

```
POKE 56,28:CLR:PRINTFRE(0)
```

Now there are 3,069 bytes free. The 512 bytes are now set aside and protected.

Making It Work With The Expanded VIC

In the expanded (8K or more) VIC, reserving the memory for the custom characters is a little more complicated. The VIC chip, which points to the character set (more about this later), cannot "see" expansion memory. Because of this, you cannot reserve a few pages at the top of memory for the character set.

Not to worry, though—there's a way around this. If you move the start of BASIC up, you can POKE the custom characters into the RAM below BASIC.

Before performing any of the following POKEs, turn off your VIC, plug in an 8K or larger expander, then turn it back on.

When you use an 8K or more expander, BASIC memory starts at 4608. To make room for the custom characters, we'll move the start of BASIC to 5632. The area of memory running from 4608 to 5631 can then be used to safely store the custom characters. With this setup, the 64 custom characters will go into the 512 bytes of memory from 5120 to 5631.

Memory locations 43 and 44 control the *start of BASIC memory.* To change the beginning of BASIC, you have to POKE new values here. To move BASIC to 5632, POKE 44,22. A word of caution before performing any of these POKEs: Don't do so with a BASIC program in memory or you could lose part of your program.

The next set of pointers that has to be changed to move BASIC are bytes 45 and 46. These two bytes control the *start of variables.* As you write your BASIC programs, the values in these pointers continually change, always keeping the variables just three bytes past the end of your BASIC program. To move the start of variables, POKE 46,22.

One last pointer to change: bytes 641 and 642. These two bytes control the *start of the operating system.* Here we'll POKE 642,22.

The next and last step is to POKE a zero where the new start of BASIC is. To do this POKE 5632, 0 then type and enter NEW.

Following is a short machine language program that will automatically set up the expanded VIC as mentioned above. RUN the program, then LOAD your BASIC program.

```
10 FORA=8192TO8224:READB:POKEA,B:NEXT:SYS
   8192:CLR
20 DATA 169,0,141,129,2,141,0,22,141,1,22
   ,141,2,22,169,1,133,43,169,3,133,45
30 DATA 169,22,133,44,133,46,141,130,2,96
   ,234
```

Tell The VIC Where To Look

The VIC (Video Interface Chip) chip in your VIC-20 controls sound, video, modes of color operation, and more. It also tells the operating system where to find the character set. In order to use the custom characters, you have to tell the computer where to find them.

Memory location 36869 (on the VIC chip) is a pointer that tells the VIC where to get its character set information. To get the VIC to look at the custom character set, we have to POKE new values here. When using the areas of memory we've reserved, use one of the following POKEs:

POKE 36869,205 (For the 8K or more expanded VIC).
POKE 36869,255 (For the unexpanded VIC).

To return to the standard character set, POKE 36869,192 (for the expanded VIC), or POKE 36869,240 (for the unexpanded VIC).

Using The Standard Character Set

The 64 custom characters you create and store in the reserved area will correspond to the first 64 *screen POKE codes.* That is, the first eight bytes will correspond to screen *POKE* character 0 (@), the next eight bytes character 1 (A), and so forth.

If you wish to use part of the standard character set, it can be copied and placed into the area reserved for the custom characters. Use one of the following lines in your program to do so:

(for unexpanded VIC)

```
10 B=7168:C=7679:D=32768:FORA=BTOC:POKEA,
   PEEK(D):D=D+1:NEXT
```

(for expanded VIC)

```
10 B=5120:C=5631:D=32768:FORA=BTOC:POKEA,
   PEEK(D):D=D+1:NEXT
```

Creating your custom characters is up to you. There are many good reference materials available including the *Programmer's Reference Guide* and past issues of COMPUTE!'s GAZETTE.

Next month we'll design some custom characters, and look at how to use them to simulate smooth, high-resolution animation.

Animating The VIC

Mike Scharland

Fast animation in a BASIC program might seem to be a contradiction. The useful technique presented here can spice up almost any game that depends on fast action.

How many times have you wished you could add some blinking stars, whirring planets, or flashing explosions to your favorite game? If you've written any arcade-style games in BASIC, you may have tried this a few times. There are a variety of ways to speed up BASIC, using variables rather than ASCII numbers, for example.

But there comes a point when you can't add any more speed. The more characters there are to move around, the slower the game gets. And as the pace slows, the game loses its appeal.

The Multicolor Blinker

A fairly simple method (and it doesn't even involve machine language) is to use multicolor characters. To get an idea of how it looks, enter this short program:

```
10 POKE36878,15:POKE36879,11:PRINT"{CLR}"
20 POKE36876,INT(RND(1)*127+128):POKE3687
   8,100-SQR(100)
25 IFRND(1)*11>4THENPOKE36878,15:GOTO20
30 Y=INT(RND(1)*512+1):POKE38400+Y,INT(RN
   D(1)*9+8)
35 POKE7680+Y,42+RND(1)*2:POKE36878,15:GO
   TO20
```

Your screen should quickly fill up with several hundred flashing, blinking characters—a lot of action for a five-line program.

In a larger program, the flashing will be a little slower, depending on how many lines are executed in the loop.

The first line sets the volume of the sound and the screen color. Experimenting with different colors will give you different effects. The second line POKEs a random note into one of the sound registers. POKE 36878,100−SQR(100) is responsible for the blinking of the characters.

You could use 90 instead of 100, as in SQR(90), but in this case the time it takes to calculate a square root slows the program a little, to make the blinking more obvious.

Memory location 36878 does two things. The first four bits control the volume of sound (fifteen is the loudest). The last four bits control the auxiliary color in multicolor mode. If you set this color to match the screen, parts of the characters will seem to become invisible.

Line 25 checks the random number generator, in effect slowing down the program a little more.

Line 30 picks a random screen location and POKEs color memory with a number from eight to fifteen. Normally, you would use a number from zero to seven for character colors. Adding eight tells the VIC to switch from regular characters to multicolor characters.

Finally, an asterisk (*) or plus sign (+) is put on the screen, in line 35. Notice that lines 25 and 35 both POKE 36878,15. Rapidly alternating the value of the auxiliary color (the high nybble of 36878) gives the blinking effect.

Animating A Program

Following is a simple game which uses the technique described above. It's called "Pop Up" and runs on an unexpanded VIC with a joystick.

The object is to move the pi character around the screen without hitting any of the characters which keep popping up. You get one point for each space you move through. The game is fairly easy, and you should be able to survive a long time. The only danger is if a character pops up right on top of you.

Lines 57–70 illustrate the blinking character technique. Note that because of the time used to read the joystick and move the pi character, the blinking is slower in the game than in the example program.

Now that you have a new technique to add to your bag of BASIC tricks, you might want to experiment with custom characters in multicolor mode. Some of the effects with this technique are quite nice.

See program listing on page 171.

Screen Headliner

Todd Heimarck, Assistant Editor

This short machine language routine expands a letter to four times its normal size. The large character can then be used in a headline or for a variety of other purposes. The program is also compatible with Commodore printers. For the VIC and 64.

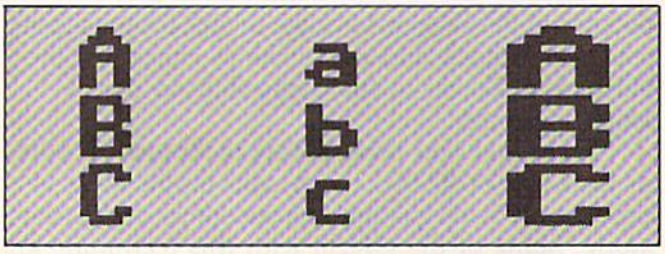
Oversized characters can be useful—on a title screen, in a children's alphabet or math program, or for visually impaired computer users. Finding the right combination of graphics characters usually takes time; you have to experiment. And creating a whole alphabet can use up a lot of memory.

The simplest method for displaying huge letters without experimenting or wasting memory is to PEEK the character generator in ROM and print a solid block (reverse space) for each bit that is on. And if the bit is off, you print a space. The one major disadvantage to this method is that each character expands to eight times its normal size. Very little space remains on the screen. But keeping in mind the idea of reading character ROM, we can sidestep this problem with some special Commodore characters.

The Quarter Square Solution

Hold down the Commodore key and type IKBVDCF. These seven characters, plus a blank space, make up half of the quarter square graphics set. The other half is accessed by typing the same keys while reverse is turned on. There are 16 different characters, one for each combination of quarter squares turned on or off.

Quarter squares enable you to set up what amounts to a medium-resolution screen. It's less complicated to program than a high-res screen, and has better resolution than the usual low-resolution character set. Instead of making characters turn on and off, you control big pixels (each of which is one fourth of a character). A VIC-20 suddenly has a 44 × 46 grid available; a 64 has the capability to address 80 × 50 big pixels.



Headliner is compatible with Commodore printers. Uppercase, lowercase, and enhanced print are illustrated here.

The 16 characters are the starting point for the "Screen Headliner." The basic idea is to read the character ROM, translate each bit into a big pixel, and print the equivalent quarter square graphics character. You can do it in BASIC with a lot of PEEKs and POKEs, but machine language is faster and more elegant.

The program is easy to use. After entering and SAVEing the program, type RUN. A short machine language program is POKEd into memory. To make it work, you need two POKEs and a SYS:

```
POKE 249,0: POKE 250,1: SYS 828
```

You should see a large capital "A," four characters wide and four deep. Now simultaneously press Commodore and SHIFT to switch to the upper/lowercase set. Cursor up to the POKEs, press RETURN, and you will see a large lowercase "a." Now try putting a 129 into location 250; the result is the same character printed in reverse.

If you've SAVEd a copy of Headliner, type NEW to erase the BASIC loader program. (It won't affect the ML program, which is safely tucked into the cassette buffer.) Now type this in:

```
2 MK=7:REM FOR VIC-20, USE 3
5 PRINT"{CLR}";
10 FORX=0TO255
20 Y=(XANDMK)*4:POKE249,Y
25 IFXANDMKTHENPRINT"{4 UP}";
30 POKE250,X:SYS828
40 NEXT
```

(Note: Tape users should not SAVE this example program; tape operations erase Headliner from the cassette buffer.) Type RUN and the whole Commodore character set will parade down the screen.

The top of the large character is printed wherever the cursor happens to be when you SYS. The POKE to 249 determines how far the cursor spaces over before it begins. The number

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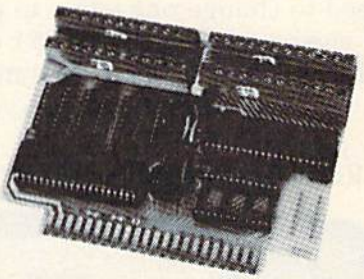

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must be between 0 and 17 on a VIC, or between 0 and 35 on a 64.

Next, POKE the letter's screen code into 250. Ignore the ASCII value, you want the screen code—the number you use when POKEing a character to the screen. Numbers 1 through 26 are the letters A-Z, 48-57 are the characters zero through nine, and so on. To get a reversed character, add 128 to the screen code.

After you've POKEd into 249 and 250, enter SYS 828. The oversize character appears almost instantly.

Four Bonuses And A Drawback

The original version of this routine (used in "Aardvark Attack" a year ago, and more recently in "Campaign Manager") figured out the shape of the large character and POKEd the appropriate quarter square graphics to the screen. But Headliner now PRINTs (using the Kernal PRINT routine at $FFD2) instead of POKEing. It's necessary to turn reverse on and off repeatedly to get all the quarter squares, which is a little cumbersome. But there are some major advantages to sending everything through $FFD2.

The first advantage is that the VIC version doesn't care what kind of memory expansion is plugged in. You don't have to use different versions for different memory sizes: One program fits all. In fact, the Kernal PRINT vector is common to the VIC and 64.

Another bonus is that you can send large characters to a Commodore printer, although you need to change one value to print spaces instead of cursor-rights (see line 951 of the 64 version, VIC line 923). Enter this to make a printout:

```
OPEN 4,4: CMD4: POKE 249,xx: POKE 250,yy:
SYS 828
```

Remember to replace *xx* with the location where you want to print, and substitute the screen code for *yy*. If you can, adjust your printer's line spacing to zero—so there is no extra space between the characters. When you're finished printing, PRINT#4:CLOSE4 properly closes the file to the printer. (See the figure for an example.) Unfortunately, printers do not allow cursor up movements; you are limited to one large character per line. To get around this limitation, you could manually move the paper back, or use a screen dump program, or (if you're feeling ambitious) use CMD to send output to a tape or disk file and then read the data back into an array for dumping to the printer.

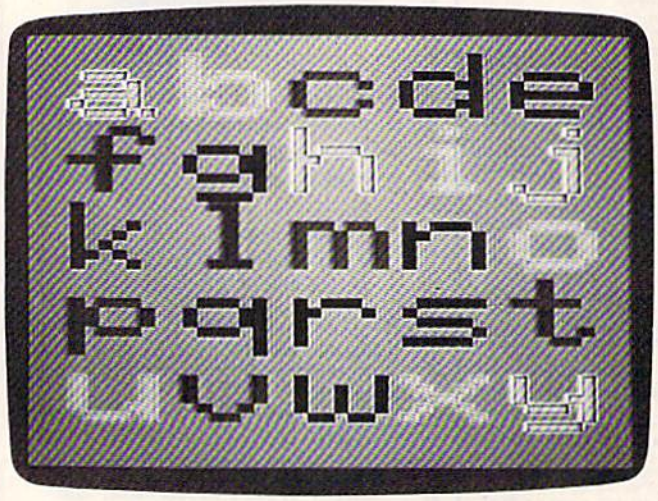
A third bonus of PRINTing rather than POKEing is that Screen Headliner is completely compatible with "Screen-80" (elsewhere in this issue); you can use large letters (up to 19 per line) in combination with 80-column text on your Commodore 64.

Finally, the flexibility of the PRINT command is at your fingertips: You can print almost anywhere on the screen, in any color you like (just change the cursor color). You can even mix large uppercase, lowercase, and graphics characters on the same screen.

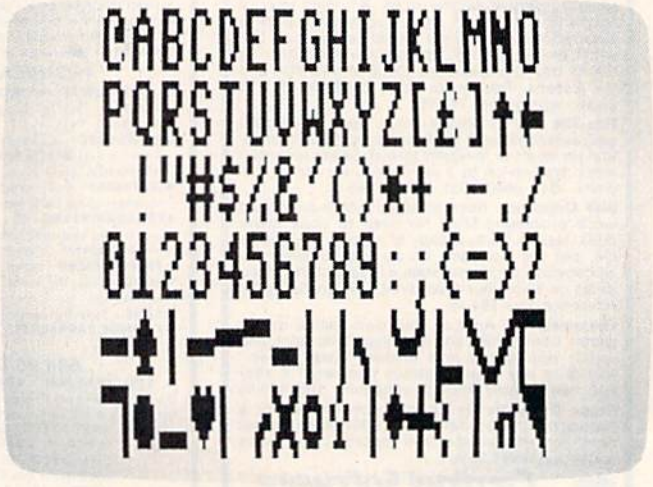
A slight drawback is that each line has to be followed by a carriage return, which means you cannot put a character at the right edge of the screen.

How It Works

There are two sets of POKEs in the BASIC loader program. The first loop (688 to 703) contains the modified ASCII values of the quarter square graphics characters. Since there is no such thing as an ASCII value of a reversed character, the reverse flag has to be turned on and off. Bit 6 of each character is used to signal whether or not



The VIC version prints up to 25 large letters in any color.



When used with Screen-80, you get large condensed characters. (64 version—also works in full-color 40 columns).

the character is reversed; the number is then ANDed with $BF (191) to turn off bit 6 before the character is printed.

The second loop (828 on) is the machine language routine. It goes into the cassette buffer, but is written to be relocatable—if you need the cassette buffer for another ML program, or if you are using a Datassette, you can move the routine anywhere else in memory (the first loop has to stay where it is, however). If you put it in BASIC RAM, you'll have to protect it from being overwritten.

If you're interested in machine language, here's a brief explanation of how Headliner works. The main routine first checks which character set is being used and sets a zero page pointer accordingly. The screen code number is then multiplied by eight and added to the pointer. Once the pointer is set, the bytes from character ROM are loaded in two by two. By alternately shifting left the bytes (ASL) and rotating left the accumulator (ROL), a number from zero to fifteen is generated. This is used as an offset to look up the appropriate quarter square graphics character in the table at 688. Bit six is checked (if set, reverse is turned on) and finally, a JSR to $FFD2 prints the character. The program then loops back to get the next set of bits.

See program listings on page 147.

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HORIZONS: 64

Charles Brannon
Program Editor

Several readers have found that some programs won't run on Commodore's SX-64 portable computer, first covered here in the July column. At the time, we had no problems with the portable, and found no incompatible software. After nearly 90 days of transporting the machine to and from the office, we found some problems using SpeedScript with it. The directory listed very slowly and would sometimes freeze up the machine. Also, disk loads and saves were unreliable, took too long, and would sometimes lock up the system (although the RUN/STOP key would break out of the lock-up). Printer output worked just fine.

SpeedScript was carefully written to avoid illegal programming techniques which might cause a program to be incompatible with future revisions of the 64. The copy files program on the 1541 test/demo disk will also not run properly on the SX-64, but the same program on the SX-64 test/demo disk will work, indicating some change has been made. As far as we can tell, the problem seems to be in the disk hardware, or the DOS used in the SX-64's disk drive. Several readers have had this problem.

Some of the exciting market entries announced at CES are the new thermal transfer printers, which have made high-quality printing

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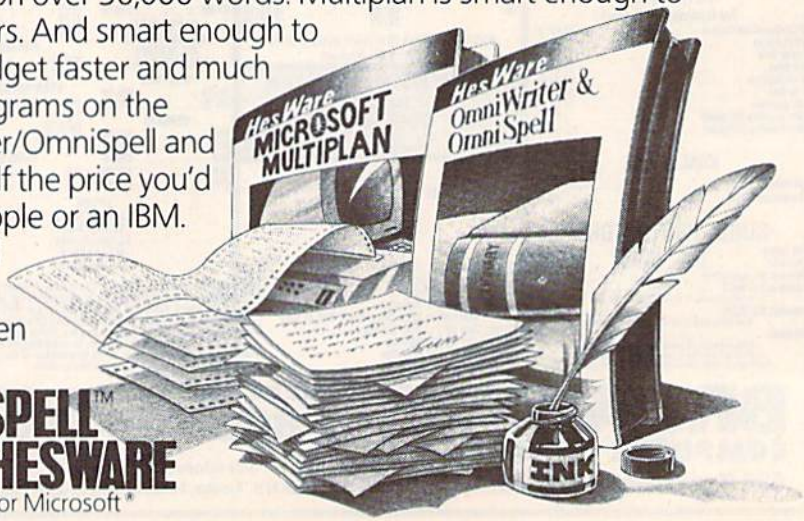

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very affordable. Unlike some thermal printers, which use heat to change the color of special thermal-sensitive paper, thermal transfer printers can print on ordinary paper. The ribbon uses a waxlike ink. The print head heats and melts the ink onto the paper. The technology is relatively simple, so some *color* thermal transfer printers cost under $200. These printers are extremely quiet, and the quality is actually better than impact dot matrix printers, with a raised type you can actually feel. Thermal transfer printers are a little slower (around 60 characters per second), and the ribbon only lasts for about 50 pages. We're currently working with Commodore's new MCS-801 color dot matrix printer. This is not a thermal transfer printer, but prints across a four-color ribbon. It's similar to the MPS-801, but has a few features of the 1526. Unfortunately, the codes and modes used to program the MCS-801 are not fully compatible with those used on either the MPS-801, 1525, or 1526 printers.

The case is charcoal gray, Commodore's new favorite color, and it looks strikingly similar to Commodore's newest computer, the Plus/4. When setting up the printer, you'll need a lot of patience. I spent 15 minutes trying to follow the poorly translated (from Japanese, obviously) manual to install the ribbon. Obviously, this is only a preliminary manual, which, despite its claim to be a friendly guide to using your MCS-801, harks back to the dark ages of computer documentation.

Most ribbons rest horizontally, parallel to the carriage, and I struggled with the ribbon, trying in vain to see how it could possibly fit. The protrusions on the bottom of the ribbon couldn't match any sockets behind the print head. Finally, it all fell into place—literally. The crazy ribbon clicked in securely at a 45-degree angle. Then I realized that at a 45-degree angle, the print head can print across all four colors in a single pass.

The ribbon has four reservoirs of ink, which paint the ribbon to keep the ink fresh and wet. Each reservoir can be turned on and off to prevent drying out if you are not using certain colors. It's probably best to turn off the colors when you shut down the printer.

By combining colors, the MCS-801 can print text and graphics in the eight primary Commodore colors: white, black, red, cyan, purple, green, blue, and yellow. You open a channel to the printer as usual, OPEN 4,4. You can then print text with PRINT#4. To change colors, you use PRINT#4,CHR$(20);CHR$(*n*). The second value, *n*, is a number from 0–7. The printer also has two graphics modes. One prints much like Epson or Prowriter graphics; you send a code designating how many columns of graphics dots

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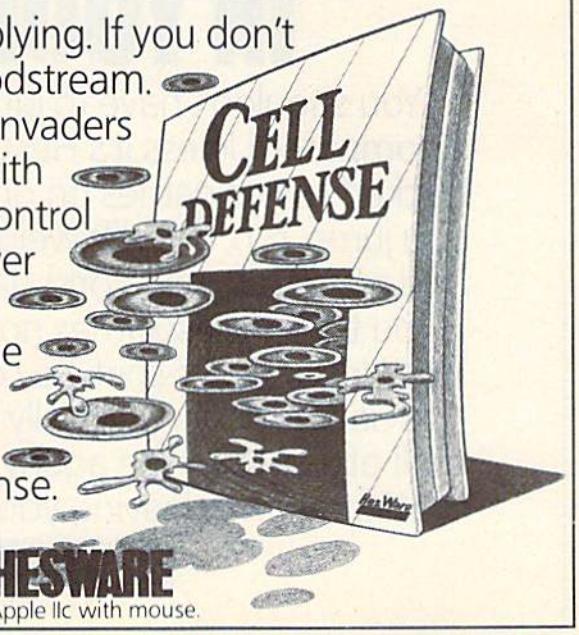

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you want to print, then send the graphics bytes. Another way of printing is similar to how TV sets are refreshed, one pixel row at a time, sweeping left to right. You tell the printer how many columns and rows you want to send, then give one byte for each dot. It appears to be the simplest mode to use.

Other features include elongated characters, a single programmable character, full support of keyboard graphics and reverse video, and a listing mode that prints program listings as they appear on the screen. The printer is fairly fast, clipping along at 50 characters per second.

To our knowledge, there is no software that supports this printer. Unfortunately, there are only a few sample programs in the manual, and no program to perform a full-color high-resolution screen dump. You have to write your own to support this printer (some word processors, including SpeedScript, can change printing colors with embedded codes). Amazingly, the manual states that the primary, most important use of the printer is to print program listings.

As you read in our CES feature, there is an overwhelming amount of new hardware and software for the 64. The flow of software has swelled from a trickle to a torrent, and now the dam has burst. We'll try to review the best and the brightest here, with an emphasis on uniqueness. Write and tell us what you want to see: more hardware reviews, more game reviews, or reviews of programming languages and utilities. If you want to see fewer reviews and more programming tips and tutorials, let us know. Any other ideas and suggestions are also greatly appreciated. Send your comments to the attention of Horizons 64.

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Cursor GET For VIC And 64

David Mills

This practical subroutine lets you create a cursor for use during GET routines.

It sometimes makes more sense to use GET rather than INPUT when asking a user for information. The GET command is a little more flexible and gives you more control over the characters entered.

But there is a drawback. INPUT gives you a blinking cursor, which you don't have with GET.

Because the cursor is often convenient (sometimes essential), let's look at a subroutine to provide a cursor while using the GET statement for input.

First, to see why the cursor is significant, type the following program:

```
10 FOR K=1 TO 30
20 GET A$:IF A$="" GOTO 20
30 PRINT A$;:NEXT K
```

When you run this program, the computer will GET and PRINT 30 keystrokes. Notice that the cursor has vanished.

The vanishing cursor can be a big problem if you include keystrokes such as cursor movement, RETURNs, DELETEs, etc., in your input. In these cases it's very easy to forget where the cursor is. The only way to find out is to start typing and see where the letters appear on the screen.

Creating A Cursor

The short subroutine provided with this article will provide the standard blinking cursor format during GET routines.

It is invisible to the host program even if it is embedded, because the first statement sends the host program around the subroutine. Also, to minimize the chance of interference with any other program, I've used variables starting with X. This makes it harder to follow, but safer to use as long as you avoid such variables in the main program.

It's called by using GOSUB 1102, and on return A$ will have the character from the GET statement.

In lines 1102–1104, XL% is set to the memory address of the screen cursor. In line 1104,

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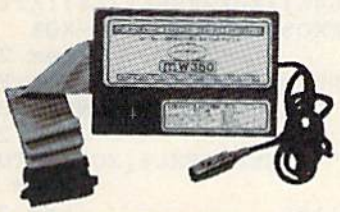

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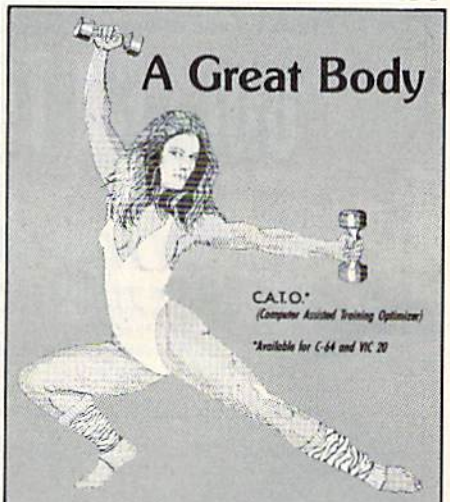

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XC is set to the color memory address and the program compensates for different memory sizes on the VIC. In line 1105 the current color (PEEK(646)) is put in the color memory, XO% is set to the character at the cursor, and XT% and XQ% are set up for the blink process. In line 1106, XT% is reversed and POKEd into the cursor position on the screen. Then XQ% is reset for the next blink, and a FOR/NEXT loop that actually gets the character is started.

If something has been typed in, line 1107 resets the screen and RETURNs; otherwise, the FOR/NEXT loop continues in line 1108. When the loop is complete, the screen character is reversed again and the process repeats.

You can remove the few REMarks in this program except line 1109. Line 1101 directs the host program to line 1109. If you remove the REM statement, line 1109 vanishes and you'll get an execution error.

Refer to the "Automatic Proofreader" article before typing these programs.

Program 1: Cursor GET For VIC-20

```
10 GOSUB1102:PRINTA$;:GOTO10:REM THIS IS
   {SPACE}THE "HOST" PROGRAM        :rem 77
1101 GOTO1109:REM GET WITH CURSOR BLINK
                                    :rem 79
1102 XL%=PEEK(211)                 :rem 212
1103 IFXL%>21THENXL%=XL%-22:GOTO1103
                                    :rem 133
1104 XL%=XL%+PEEK(214)*22+4096:XC=33792+X
     L%:IFPEEK(210)>20THENXC=XC+512:XL%=X
     L%+3584                        :rem 70
1105 POKEXC,PEEK(646):XO%=PEEK(XL%):XT%=X
     O%:XQ%=128:IFXO%>127THENXQ%=-XQ%
                                    :rem 235
1106 XT%=XT%+XQ%:POKEXL%,XT%:XQ%=-XQ%:FOR
     XR=1TO60:REM CHANGING 60 CHANGES BLI
     NK SPEED                       :rem 238
1107 GETA$:IFA$<>""THENPOKEXL%,XO%:RETURN
                                    :rem 51
1108 NEXT XR:GOTO1106              :rem 238
1109 REM                           :rem 175
```

Program 2: Cursor GET For The 64

```
10 GOSUB1102:PRINTA$;:GOTO10:REM THIS IS
   {SPACE}THE "HOST" PROGRAM        :rem 77
1101 GOTO1109:REM GET WITH CURSOR BLINK
                                    :rem 79
1102 XL%=PEEK(211)                 :rem 212
1103 IFXL%>39THENXL%=XL%-40:GOTO1103
                                    :rem 142
1104 XL%=XL%+PEEK(214)*40+1024:XC=54272+X
     L%                             :rem 87
1105 POKEXC,PEEK(646):XO%=PEEK(XL%):XT%=X
     O%:XQ%=128:IFXO%>127THENXQ%=-XQ%
                                    :rem 235
1106 XT%=XT%+XQ%:POKEXL%,XT%:XQ%=-XQ%:FOR
     XR=1TO60                       :rem 81
1107 GETA$:IFA$<>""THENPOKEXL%,XO%:RETURN
                                    :rem 51
1108 NEXT XR:GOTO1106              :rem 238
1109 REM                           :rem 175
```


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MLX Machine Language Entry Program

For Commodore 64

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost failsafe entry of machine language programs published in COMPUTE!'s GAZETTE. You need to know nothing about machine language to use MLX—it was designed for everyone. There are separate versions for the Commodore 64.

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

```
LOAD "filename",1,1   (for tape)
LOAD "filename",8,1   (for disk)
```

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save the correct version of MLX for your computer (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the SPACE bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad (lines 581–584):

```
    U I O            7 8 9
H   J K L   become   0 4 5 6
    M , .            1 2 3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later.

MLX recognizes these commands:

SHIFT-S: Save	**SHIFT-N: New Address**
SHIFT-L: Load	**SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

What if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

See program listing on page 170.

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time.* This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example *":rem 123". Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Since the Proofreader is a machine language program stored in the cassette buffer, it will be erased during a tape SAVE or LOAD. If you intend to type in a program in more than one sitting or wish to make a safety SAVE, follow this procedure:

1. LOAD and RUN the Proofreader.
2. Disable it by pressing RUN/STOP–RESTORE.
3. Type the following three lines in direct mode (without line numbers):

```
A$="PROOFREADER.T":B$="{10 SPACES}":FO
RX=1TO4:A$=A$+B$:NEXTX
FORX=886 TO 1018:A$=A$+CHR$(PEEK(X)):N
EXTX
OPEN1,1,1,A$:CLOSE1
```

After you type the last line, you will be asked to press RECORD and PLAY. We recommend you start at the beginning of a new tape.

You now have a new version of the Proofreader (PROOFREADER.T, as renamed in the above code). Turn your computer off and on, then LOAD the program you were working on. Put the cassette containing PROOFREADER.T into the tape unit and type:

OPEN1:CLOSE1

You can now get into the Proofreader by typing SYS 886. To test this, PRINT PEEK (886) should return the number 173. If it does not, repeat the steps above, making sure that A$ (PROOFREADER.T) contains 13 characters and that B$ contains 10 spaces.

The new version of Automatic Proofreader will load itself into the cassette buffer whenever you type OPEN1:CLOSE1 and PROOFREADER.T is the next program on your tape. It will not disturb the contents of BASIC memory.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Power Basic

(Article on page 136.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

Screen Headliner—64 Version

```
5 PRINT"{CLR}PLEASE WAIT A MOMENT"
                                    :rem 153
10 T=0:FORJ=688TO703:READK:T=T+K:POKEJ,K:
   NEXT                             :rem 134
15 IFT<>3078THENPRINT"ERROR IN DATA STATE
   MENTS":STOP                      :rem 88
20 T=0:FORJ=828TO1006:READK:T=T+K:POKEJ,K
   :NEXT                            :rem 176
25 IFT<>20306THENPRINT"ERROR IN DATA STAT
   EMENTS":STOP                     :rem 130
30 POKE249,0                        :rem 141
688 DATA32,188,190,226,172,225,191,251
                                    :rem 148
696 DATA187,255,161,236,162,254,252,96
                                    :rem 158
828 DATA 169,208,133,004,173,024    :rem 46
834 DATA 208,041,002,240,004,169    :rem 32
840 DATA 216,133,004,169,000,162    :rem 31
846 DATA 003,006,250,042,202,208    :rem 28
852 DATA 250,024,101,004,133,004    :rem 19
858 DATA 165,250,133,003,173,014    :rem 40
864 DATA 220,041,254,141,014,220    :rem 27
870 DATA 165,001,041,251,133,001    :rem 23
876 DATA 169,000,133,250,169,005    :rem 46
882 DATA 133,002,160,000,177,003    :rem 26
888 DATA 133,005,230,003,177,003    :rem 36
894 DATA 133,006,230,003,198,002    :rem 36
900 DATA 240,028,162,004,169,000    :rem 28
906 DATA 006,006,042,006,006,042    :rem 25
912 DATA 006,005,042,006,005,042    :rem 20
918 DATA 164,250,153,048,002,230    :rem 38
924 DATA 250,202,208,232,240,210    :rem 26
930 DATA 165,001,009,004,133,001    :rem 20
936 DATA 173,014,220,009,001,141    :rem 28
942 DATA 014,220,160,000,166,249    :rem 33
948 DATA 240,008,169               :rem 229
951 DATA 029:REM 032 IF USING A PRINTER
                                    :rem 129
952 DATA 032,210                    :rem 14
954 DATA 255,202,208,250,169,004    :rem 45
960 DATA 133,006,185,048,002,170    :rem 38
966 DATA 189,176,002,133,005,041    :rem 46
972 DATA 064,240,005,169,018,032    :rem 43
978 DATA 210,255,165,005,041,191    :rem 46
984 DATA 032,210,255,169,146,032    :rem 47
990 DATA 210,255,200,198,006,208    :rem 43
996 DATA 221,169,013,032,210,255    :rem 43
1002 DATA 192,016,208,196,096      :rem 153
```

Program 2:

Screen Headliner—VIC Version

```
5 PRINT"{CLR}PLEASE WAIT A MOMENT"
                                    :rem 153
10 T=0:FORJ=688TO703:READK:T=T+K:POKEJ,K:
   NEXT                             :rem 134
15 IFT<>3078THENPRINT"ERROR IN DATA STATE
   MENTS":STOP                      :rem 88
20 T=0:FORJ=828TO978:READK:T=T+K:POKEJ,K:
   NEXT                             :rem 145
25 IFT<>17289THENPRINT"ERROR IN DATA STAT
   EMENTS":STOP                     :rem 146
30 POKE249,0                        :rem 141
688 DATA32,188,190,226,172,225,191,251
                                    :rem 148
696 DATA187,255,161,236,162,254,252,96
                                    :rem 158
828 DATA 169,128,133,004,173,005    :rem 46
834 DATA 144,041,002,240,004,169    :rem 31
840 DATA 136,133,004,169,000,162    :rem 32
846 DATA 003,006,250,042,202,208    :rem 28
852 DATA 250,024,101,004,133,004    :rem 19
858 DATA 165,250,133,003,169,000    :rem 40
864 DATA 133,250,169,005,133,002    :rem 36
870 DATA 160,000,177,003,133,005    :rem 26
876 DATA 230,003,177,003,133,006    :rem 34
882 DATA 230,003,198,002,240,028    :rem 36
888 DATA 162,004,169,000,006,006    :rem 39
894 DATA 042,006,006,042,006,005    :rem 30
900 DATA 042,006,005,042,164,250    :rem 24
906 DATA 153,048,002,230,250,202    :rem 28
912 DATA 208,232,240,210,160,000    :rem 19
918 DATA 166,249,240,008,169       :rem 118
923 DATA 029:REM 032 IF USING PRINTER
                                    :rem 63
924 DATA 032,210,255,202,208,250    :rem 30
930 DATA 169,004,133,006,185,048    :rem 45
936 DATA 002,170,189,176,002,133    :rem 43
942 DATA 005,041,064,240,005,169    :rem 36
948 DATA 018,032,210,255,165,005    :rem 41
954 DATA 041,191,032,210,255,169    :rem 44
960 DATA 146,032,210,255,200,198    :rem 40
966 DATA 006,208,221,169,013,032    :rem 41
972 DATA 210,255,192,016,208,196    :rem 52
978 DATA 096                        :rem 97
```

Learning To Count

(Article on page 80.)

Program 1:

Learning To Count—VIC Version

```
28 POKE808,114                      :rem 251
29 POKE36879,250                    :rem 110
30 PRINT"{CLR}"SPC(244)"LEARNING TO COUNT
   "                                :rem 88
40 Z=7680:POKE36878,15:S1=36876:COL=30720
   :BC=36879                        :rem 66
50 FORI=0TO21:READA,B,C:POKEZ+I,A:POKEZ+I
   +COL,B:POKES1,C:FORT=1TO75:NEXT:POKES1
   ,0                               :rem 222
52 IFC=236THENGOSUB4000             :rem 132
53 NEXT                             :rem 167
54 FORI=0TO21:READA,B,C:POKEZ+484+I,A:POK
   EZ+484+I+COL,B:POKES1,C:FORT=1TO75:NEX
   T                                :rem 47
55 POKES1,0:IFC=236THENGOSUB4000    :rem 208
56 NEXT                             :rem 170
57 FORI=0TO22:READA,B,C:POKEZ+22*I,A:POKE
   Z+22*I+COL,B:POKES1,C:FORT=1TO75:NEXT:
   POKES1,0                         :rem 2
58 IFC=236THENGOSUB4000            :rem 138
59 NEXT                            :rem 173
```

```
60 FORI=0TO22:READA,B,C:POKEZ+21+22*I,A:P
   OKEZ+21+22*I+COLL,B:POKES1,C:FORT=1TO7
   5:NEXT                              :rem 27
61 POKES1,0:IFC=236THENGOSUB4000       :rem 205
62 NEXT:FORT=1TO2500:NEXT              :rem 109
70 PRINTCHR$(147):POKEBC,30:PRINT"
   {2 DOWN}{2 SPACES}{RVS}LEARNING TO COU
   NT{OFF}"                            :rem 172
71 PRINT"{DOWN} CAN HELP YOU LEARN"
                                       :rem 180
72 PRINT"{DOWN} TO COUNT UP TO 50.":PRINT
   "{3 DOWN} ENTER {RVS}1{OFF}, {RVS}2
   {OFF}, {RVS}3{OFF}, OR {RVS}4{OFF}."
                                       :rem 187
75 PRINT"{2 DOWN}{3 SPACES}UP TO 10---
   {RVS}1{OFF}":PRINT"{DOWN}{3 SPACES}UP
   {SPACE}TO 25---{RVS}2{OFF}":PRINT"
   {DOWN}{3 SPACES}UP TO 35---{RVS}3{OFF}
   "                                   :rem 182
76 PRINT"{DOWN}{3 SPACES}UP TO 50---{RVS}
   4{OFF}{2 RIGHT}{3 UP}";             :rem 131
77 INPUTD$                             :rem 102
80 D=VAL(D$)                           :rem 133
81 IFD=1THENDL=10:GOTO100               :rem 11
82 IFD=2THENDL=25:GOTO100               :rem 19
83 IFD=3THENDL=35:GOTO100               :rem 22
84 IFD=4THENDL=50:GOTO100               :rem 21
90 GOTO70                               :rem 9
100 POKE36878,15:S1=36876:COL=30720:R=0:W
    =0:N=0:POKEBC,27:X=DL              :rem 138
205 PRINTCHR$(147)                      :rem 18
206 A=(INT(X*RND(1)))*2                :rem 231
207 IFA/2+1=1THEN206                    :rem 91
210 N=N+1:RESTORE:SCR=7834              :rem 91
220 FORH=0TOASTEP2:C=0                 :rem 108
225 READL:READM:READK                   :rem 69
226 IFK=236THENGOSUB4000               :rem 191
230 POKESCR+H,L:POKESCR+COL+H,M:POKES1,K:
    FORT=1TO75:NEXT:POKES1,0:FORT=1TO350:
    NEXT                               :rem 140
232 IFH=20ANDL=38THENSCR=SCR+22         :rem 159
233 IFH=42THENSCR=SCR+22                :rem 221
234 IFH=64THENSCR=SCR+22                :rem 226
235 IFH=86THENSCR=SCR+22                :rem 231
236 IFH=108THENSCR=SCR+22               :rem 19
238 NEXTH                               :rem 36
239 PRINT"{19 DOWN}ENTER {RVS}0{OFF} TO S
    TART OVER.":POKE198,0               :rem 6
240 PRINT"{HOME}{2 DOWN}{2 SPACES}HOW MAN
    Y?{10 SPACES}";:PRINTSPC(22);:PRINT"
    {2 UP}{11 RIGHT}";:INPUTY$         :rem 196
245 IFY$="0"THENN=N-1:GOTO3000         :rem 244
250 Y=VAL(Y$)                          :rem 222
260 IFY=A/2+1THENGOSUB2000:R=R+1:PRINTCHR
    $(147):GOTO206                     :rem 99
270 C=C+1:IFC=3THENGOTO2500            :rem 99
280 PRINT"{HOME}{3 DOWN}{2 SPACES}{RVS}SO
    RRY! TRY AGAIN.":FORT=1TO1300:NEXT
                                       :rem 211
281 PRINT"{HOME}{3 DOWN}{20 SPACES}":GOTO
    240                                :rem 187
2000 PRINT"{CLR}{DOWN}{2 SPACES}QQQQQ
     {8 SPACES}QQQQQ":PRINT" Q{5 SPACES}Q
     {6 SPACES}Q{5 SPACES}Q"           :rem 176
2001 PRINT"{3 SPACES}[3 +][10 SPACES}
     [3 +]":PRINT"{3 SPACES}[3 +]
     {10 SPACES}[3 +]":PRINT"{3 SPACES}
     [3 +]{10 SPACES}[3 +]"            :rem 86
2002 PRINT"{4 DOWN}{9 SPACES}[4 +]
     {18 SPACES}[4 +]{18 SPACES}[4 +]"
                                       :rem 161
2003 PRINT" [+]{18 SPACES}[+]{2 SPACES}
     [+]{18 SPACES}[+]{3 SPACES}[+]
     {16 SPACES}[+]{5 SPACES}[+]";:rem 91
2004 PRINT"{14 SPACES}[+]{7 SPACES}[+]
     {DOWN}[+]{DOWN}[+]{DOWN}[8 +]{UP}[+]
     {UP}[+]{UP}[+]"                   :rem 55
2006 FORH=235TO241:POKES1,H:FORT=1TO175:N
     EXT:NEXTH                         :rem 198
2007 FORH=241TO235STEP-1:POKES1,H:FORT=1T
     O175:NEXT:NEXTH:POKES1,0:RETURN
                                       :rem 196
2500 PRINT"{CLR}{3 DOWN}"SPC(8)"WRONG!"SP
     C(8):PRINT"{3 DOWN} THERE WERE";A/2+
     1;"{LEFT} OBJECTS "               :rem 118
2501 POKE36876,159                     :rem 208
2502 FORT=1TO800:NEXT:POKE36876,0:FORT=1T
     O3500:NEXT:PRINTCHR$(147):W=W+1:GOTO
     206                                :rem 1
3000 PRINT"{CLR}{8 DOWN}{2 SPACES}YOU HAD
     :";N;"TRYS"                       :rem 13
3001 PRINT"{DOWN}"SPC(10);R;"RIGHT":PRINT
     "{DOWN}{2 RIGHT}{8 SPACES}";W;"WRONG
     "                                 :rem 188
3005 FORT=1TO4000:NEXT:GOTO50          :rem 41
4000 RESTORE:RETURN                     :rem 2
9000 DATA81,0,219,65,2,221,83,3,223,90,4,
     225,88,5,227,90,6,228,102,7,229,42,0
     ,231,35,2                         :rem 169
9001 DATA232,36,3,233,38,4,235,0,5,236
                                       :rem 116
```

Program 2:
Learning To Count—64 Version

```
28 POKE788,52:POKE53281,0:POKE53280,0:S=5
   4272                                :rem 48
30 PRINT"{CLR}{12 DOWN}"TAB(11)"{WHT}LEAR
   NING TO COUNT"                      :rem 226
35 FORL=STOS+24:POKEL,O:NEXT:POKES+5,14:P
   OKES+9,240:POKES+24,15:HF=S+1:LF=S
                                       :rem 217
40 Z=1024:C=0:COL=S:DL(1)=10:DL(2)=25:DL(
   3)=35:DL(4)=50                      :rem 19
50 FORI=0TO39:READA:READB:POKEZ+I,A:POKEZ
   +I+COL,B:GOSUB5000:FORT=1TO75:NEXT
                                       :rem 124
52 IFB=5THENRESTORE                    :rem 253
53 NEXT                                :rem 167
54 FORI=0TO39:READA:READB:POKEZ+960+I,A:P
   OKEZ+960+I+COL,B:GOSUB5000          :rem 169
55 FORT=1TO75:NEXT:IFB=5THENRESTORE
                                       :rem 107
56 NEXT                                :rem 170
57 FORI=0TO24:READA:READB:POKEZ+40*I,A:PO
   KEZ+40*I+COL,B:GOSUB5000            :rem 46
58 FORT=1TO75:NEXT:IFB=5THENRESTORE
                                       :rem 110
59 NEXT                                :rem 173
60 FORI=0TO24:READA:READB:POKEZ+39+40*I,A
   :POKEZ+39+40*I+COLL,B:GOSUB5000
                                       :rem 162
61 FORT=1TO75:NEXT:IFB=5THENRESTORE
                                       :rem 104
62 NEXT:FORT=1TO2500:NEXT              :rem 109
70 PRINTCHR$(147):PRINT"{2 DOWN}
   {4 SPACES}{RVS}LEARNING TO COUNT{OFF}
   {SPACE}CAN HELP YOU"                :rem 39
72 PRINT"{DOWN}{4 SPACES}LEARN TO COUNT U
   P TO 50."                           :rem 196
```

```
73 PRINT"{3 DOWN}{4 SPACES}ENTER {RVS}1
   {OFF}, {RVS}2{OFF}, {RVS}3{OFF}, OR
   {RVS}4{OFF}."                    :rem 153
75 PRINT"{4 DOWN}{5 SPACES}UP TO 10---
   {RVS}1{OFF}":PRINT"{DOWN}{5 SPACES}UP
   {SPACE}TO 25---{RVS}2{OFF}"      :rem 174
76 PRINT"{DOWN}{5 SPACES}UP TO 35---{RVS}
   3{OFF}":PRINT"{DOWN}{5 SPACES}UP TO 50
   ---{RVS}4{OFF}{2 RIGHT}{3 UP}";
                                    :rem 173
80 INPUTD$:D=VAL(D$):IFD<1ORD>4THEN70
                                    :rem 30
100 R=0:W=0:N=0:X=DL(D):PRINT"{CLR}"
                                    :rem 213
206 A=(INT(X*RND(1)))*2:IFA/2+1=1THEN206
                                    :rem 227
210 N=N+1:RESTORE:SCR=1304          :rem 77
220 FORH=0TOASTEP2:C=0              :rem 108
225 READL:M=INT(RND(0)*15)+1        :rem 82
226 IFL=5THENRESTORE                :rem 58
230 POKESCR+H,L:POKESCR+COL+H,M:FORT=1TO7
   5:NEXT:GOSUB5000:FORT=1TO350:NEXT
                                    :rem 94
232 IFH=39THENSCR=SCR+80            :rem 230
238 NEXT                            :rem 220
239 PRINT"{19 DOWN}{10 SPACES}ENTER {RVS}
   0{OFF} TO START OVER.":POKE198,0
                                    :rem 6
240 PRINT"{HOME}{2 DOWN}{16 SPACES}";:INP
   UT"{HOME}{2 DOWN}{2 SPACES}HOW MANY";
   Y$                               :rem 245
245 IFY$="0"THENN=N-1:GOTO3000      :rem 244
250 Y=VAL(Y$)                       :rem 222
260 IFY=H/2THENGOSUB2000:R=R+1:PRINTCHR$(
   147):GOTO206                     :rem 14
270 C=C+1:IFC=3THENGOTO2500         :rem 99
280 PRINT"{HOME}{3 DOWN}{RVS}SORRY! TRY A
   GAIN.":FORT=1TO1700:NEXT:GOSUB4000:GO
   TO240                            :rem 94
2000 PRINT"{CLR}{4 DOWN}{WHT}"TAB(6)"
   {4 SPACES}QQQQQ{8 SPACES}QQQQQ "
                                    :rem 59
2001 PRINTTAB(6)"{3 SPACES}Q{5 SPACES}Q
   {6 SPACES}Q{5 SPACES}Q"          :rem 54
2002 PRINTTAB(6)"{BLU}{5 SPACES}{3 +}
   {10 SPACES}{3 +}{2 SPACES}"      :rem 246
2003 PRINTTAB(6)"{5 SPACES}{3 +}
   {10 SPACES}{3 +} {6 DOWN}"       :rem 62
2004 PRINTTAB(6)"{RED}{11 SPACES}{4 +}
   {8 SPACES}"                      :rem 169
2005 PRINTTAB(6)"{CYN}{2 SPACES}{+}
   {7 SPACES}{RED} {4 +}{8 SPACES}{CYN}
   {+}"                             :rem 52
2006 PRINTTAB(6)"{2 SPACES}{+}{20 SPACES}
   {+}"                             :rem 67
2007 PRINTTAB(6)"{3 SPACES}{+}{18 SPACES}
   {+} "                            :rem 68
2008 PRINTTAB(6)"{4 SPACES}{+}{16 SPACES}
   {+}{2 SPACES}"                   :rem 69
2009 PRINTTAB(6)"{5 SPACES}{+}{14 SPACES}
   {+}{3 SPACES}"                   :rem 70
2010 PRINTTAB(6)"{6 SPACES}{+}{12 SPACES}
   {+}{4 SPACES}"                   :rem 62
2011 PRINTTAB(6)"{7 SPACES}{12 +}
   {4 SPACES}{WHT} "                :rem 192
2020 GOSUB5010:RETURN               :rem 36
2500 PRINT"{CLR}{10 DOWN}"TAB(16)"{RVS}WR
   ONG!{OFF}"                       :rem 250
2510 PRINT"{2 DOWN}"TAB(9)"{RVS}THERE WER
   E";H/2;"{LEFT} OBJECTS{OFF}":rem 185
2520 FORT=1TO800:NEXT:FORT=1TO3500:NEXT:P
   RINTCHR$(147):W=W+1:GOTO206      :rem 46
3000 PRINT"{CLR}{10 DOWN}"TAB(10)"YOU HAD
   :";N;"TRYS":PRINT"{DOWN}"TAB(18);R;"
   RIGHT"                           :rem 51
3010 PRINT"{DOWN}{2 RIGHT}"TAB(18);W;"WRO
   NG":FORT=1TO4000:NEXT:RESTORE:GOTO50
                                    :rem 8
4000 PRINT"{HOME}{3 DOWN}{20 SPACES}";:RE
   TURN                             :rem 48
5000 POKES+4,17:POKEHF,INT(RND(0)*50)+80:
   POKELF,250:POKES+4,16:RETURN:rem 166
5010 POKES+4,17:FORM=70TO116STEP2:POKEHF,
   M:POKELF,INT(M/2):FORDL=1TO40:NEXT
                                    :rem 22
5020 NEXT:POKES+4,16:RETURN        :rem 206
9000 DATA81,1,65,2,83,3,90,4,88,5,90,6,10
   2,7,42,1,35,2,36,3,38,4,1,5      :rem 41
```

Disk Tricks

(Article on page 126.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Change Disk Name

```
999 REM END: REM PROGRAM 1: CHANGE DISK N
   AME                              :rem 249
1000 INPUT "{CLR}NEW DISK NAME";DN$
                                    :rem 79
1010 IF LEN(DN$)<16 THEN DN$=DN$+CHR$(160
   ):GOTO 1010:REM STRETCH TO 16 CHARS
                                    :rem 177
1020 IF LEN(DN$) > 16 THEN DN$=LEFT$(DN$,
   16): REM SHORTEN NAME TO 16 CHARACTE
   RS                               :rem 52
1030 OPEN 15,8,15,"I": REM OPEN DISK COMM
   AND CHANNEL                      :rem 126
1040 OPEN 8,8,8,"#": REM OPEN DIRECT ACCE
   SS CHANNEL                       :rem 64
1050 PRINT#15, "U1:"8;0;18;0: REM READ TR
   ACK 18, SECTOR 0 INTO CHANNEL 8 BUFF
   ER                               :rem 39
1060 PRINT#15, "B-P:"8;144: REM MOVE BUFF
   ER-POINTER TO FIRST BYTE OF DISK NAM
   E                                :rem 239
1070 PRINT#8, DN$;: REM PUT NEW NAME IN C
   HANNEL 8 BUFFER, REPLACING OLD NAME
                                    :rem 50
1080 PRINT#15,"U2:"8;0;18;0:REM WRITE BUF
   FER WITH NAME CHANGED            :rem 108
1090 CLOSE 8: REM CLOSE DIRECT ACCESS CHA
   NNEL                             :rem 114
1100 CLOSE15: REM CLOSE COMMAND CHANNEL
                                    :rem 42
1110 REM GOTO 100: REM RESTART DISPLAY T&
   S PROGRAM IF APPENDED            :rem 127
```

Program 2: Change Disk ID

```
1999 REM END: REM PROGRAM 2: CHANGE DISK
   {SPACE}ID                        :rem 151
2000 INPUT "{CLR}NEW DISK ID";ID$:rem 183
```

```
2010 IF LEN(ID$) <> 2 THEN 2000: REM REJE
     CT IMPROPER LENGTH ID          :rem 104
2020 OPEN 15,8,15,"I": REM OPEN DISK COMM
     AND CHANNEL                    :rem 126
2030 OPEN 8,8,8,"#": REM OPEN DIRECT ACCE
     SS CHANNEL                     :rem 64
2040 PRINT#15, "U1:"8;0;18;0: REM READ TR
     ACK 18, SECTOR 0 INTO CHANNEL 8 BUFF
     ER                             :rem 39
2050 PRINT#15, "B-P:"8;162: REM MOVE BUFF
     ER-POINTER TO FIRST BYTE OF DISK ID
                                    :rem 91
2060 PRINT#8, ID$;: REM PUT NEW ID IN CHA
     NNEL 8 BUFFER, REPLACING OLD ID
                                    :rem 5
2070 PRINT#15, "U2:"8;0;18;0: REM STORE B
     UFFER TO DISK                  :rem 245
2080 CLOSE 8: REM CLOSE DIRECT ACCESS CHA
     NNEL                           :rem 114
2090 CLOSE15: REM CLOSE COMMAND CHANNEL
                                    :rem 51
2100 REM GOTO 100: REM RESTART DISPLAY T&
     S PROGRAM IF APPENDED          :rem 127
```

Program 3: Unscratch

```
2999 REM END: REM PROGRAM 3, UNSCRATCH FI
     LES                            :rem 75
3000 INPUT "{CLR}WHICH SECTOR";S$: S=VAL(
     S$): IF S<0 OR S>19 THEN 3000
                                    :rem 170
3010 PRINT "{2 DOWN}WHAT IS THE FIRST BYT
     E":PRINT"OF THE FILE YOU WISH"
                                    :rem 253
3011 PRINT"TO UNSCRATCH?"           :rem 35
3020 INPUT BP$: BP=VAL(BP$): REM INPUT FI
     LE TARGET BYTE FOR UNSCRATCH :rem 89
3030 BS=(BP=2)+(BP=34)+(BP=66)+(BP=98)+(P
     P=130)+(BP=162)+(BP=194)+(BP=226)
                                    :rem 160
3035 IFBS<>-1THEN3020:REM REJECT INVALID
     {SPACE}INPUT                   :rem 45
3040 PRINT "{2 DOWN}SELECT FILE TYPE:"
                                    :rem 22
3050 PRINT "{DOWN}{2 SPACES}1. SEQUENTIAL
     "                              :rem 4
3060 PRINT "{2 SPACES}2. PROGRAM"  :rem 18
3070 PRINT "{2 SPACES}3. USER"     :rem 59
3080 PRINT "{2 SPACES}4. RELATIVE":rem 90
3090 PRINT "{2 DOWN}WHICH ONE?"    :rem 83
3100 GET A$: IF A$="" THEN 3100  :rem 171
3110 A=VAL(A$): IF A<1 OR A>4 THEN 3100:
     {SPACE}REM REJECT INVALID CHOICE
                                    :rem 39
3120 B=A+128: REM SET INPUT BYTE TO MATCH
      DOS FILE CODES                :rem 158
3130 OPEN 15,8,15,"I": REM OPEN COMMAND C
     HANNEL TO DISK                 :rem 36
3140 OPEN8,8,8,"#": REM OPEN DIRECT ACCES
     S CHANNEL TO DISK              :rem 17
3150 PRINT#15, "U1:"8;0;18;S: REM LOAD SE
     CTOR CONTAINING FILE TO BE UNSCRATCH
     ED                             :rem 90
3160 PRINT#15, "B-P:"8;BP: REM SET BUFFER
      POINTER TO TARGET ADDRESS   :rem 163
3170 PRINT#8, CHR$(B);: REM CHANGE TARGET
      FILE CODE IN CHANNEL 8 BUFFER
                                    :rem 246
3180 PRINT#15, "U2:"8;0;18;S: REM RETURN
     {SPACE}CHANGED CONTENTS TO TARGET SE
     CTOR                           :rem 120
3190 CLOSE 8: REM CLOSE DIRECT ACCESS CHA
     NNEL                           :rem 117
3200 CLOSE 15: REM CLOSE COMMAND CHANNEL
                                    :rem 45
3210 REM GOTO 100: REM RESTART DISPLAY T&
     S PROGRAM WHEN FIRST REM REMOVED
                                    :rem 98
```

Program 4: Scratch

```
3999 REM END: REM PROGRAM 4, SCRATCH OR S
     CRATCH AND LEAVE ON DIRECTORY
                                    :rem 114
4000 PRINT"{CLR}SELECT OPTION:"    :rem 251
4010 PRINT"{DOWN}1. COMPLETE SCRATCH"
                                    :rem 103
4020 PRINT"2. SCRATCH, BUT LEAVE":rem 131
4021 PRINT"{3 SPACES}ON DIRECTORY"
                                    :rem 234
4030 PRINT"{2 DOWN}WHICH ONE?"     :rem 78
4040 GET A$: IF A$="" THEN 4040    :rem 179
4050 A=VAL(A$): IF A<1 OR A>2 THEN 4040:
     {SPACE}REM REJECT INVALID INPUT
                                    :rem 18
4060 IF A=1 THEN B=0: REM SET TO PERMANEN
     TLY DELETE                     :rem 149
4070 IF A=2 THEN B=128: REM SET TO LEAVE
     {SPACE}ON DIRECTORY            :rem 191
4080 INPUT"{2 DOWN}WHICH SECTOR";S$: S=VA
     L(S$): IF S<0 OR S>19 THEN 4080
                                    :rem 75
4090 PRINT "{2 DOWN}WHAT IS THE FIRST BYT
     E":PRINT"OF THE FILE YOU WISH":rem 6
4091 PRINT "TO SCRATCH?"           :rem 137
4100 INPUT BP$: BP=VAL(BP$): REM INPUT FI
     LE TARGET BYTE FOR SCRATCH   :rem 182
4110 BS=(BP=2)+(BP=34)+(BP=66)+(BP=98)+(B
     P=130)+(BP=162)+(BP=194)+(BP=226)
                                    :rem 160
4120 IFBS<>-1THEN4100:REM REJECT INVALID
     {SPACE}INPUT                   :rem 41
4130 OPEN 15,8,15,"I": REM OPEN COMMAND C
     HANNEL TO DISK                 :rem 37
4140 OPEN8,8,8,"#": REM OPEN DIRECT ACCES
     S CHANNEL TO DISK              :rem 18
4150 PRINT#15, "U1:"8;0;18;S: REM LOAD SE
     CTOR CONTAINING FILE TO BE SCRATCHED
                                    :rem 184
4160 PRINT#15, "B-P:"8;BP: REM SET BUFFER
      POINTER TO TARGET ADDRESS   :rem 164
4170 PRINT#8, CHR$(B);: REM CHANGE TARGET
      FILE CODE IN CHANNEL 8 BUFFER
                                    :rem 247
4180 PRINT#15,"U2:"8;0;18;S:REM RETURN CH
     ANGED CONTENTS TO TARGET SECTOR
                                    :rem 121
4190 CLOSE 8: REM CLOSE DIRECT ACCESS CHA
     NNEL                           :rem 118
4200 CLOSE 15: REM CLOSE COMMAND CHANNEL
                                    :rem 46
4210 REM GOTO 100: REM RESTART DISPLAY T&
     S PROGRAM WHEN FIRST REM REMOVED
                                    :rem 99
```

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

The Beginner's Corner

(Article on page 112.)

Program 1:

Household Inventory—64 Version

```
10 REM HOUSEHOLD INVENTORY          :rem 190
20 FOR I=1 TO 9:READ R$(I):NEXT     :rem 187
30 DATA LIVING ROOM,KITCHEN,BEDROOMS
                                    :rem 60
40 DATA BATHROOMS,UTILITY ROOM,FAMILY ROO
   M                                :rem 245
50 DATA DEN,COMPUTER ROOM,STORAGE ROOMS
                                    :rem 255
60 PRINT "{CLR}"                    :rem 202
70 PRINT TAB(12)"** INVENTORY **"   :rem 57
80 PRINT "{2 DOWN}CHOOSE:{DOWN}"    :rem 103
90 FOR I=1 TO 9:PRINT TAB(4)I;R$(I):NEXT
                                    :rem 19
100 PRINT TAB(5)"0 WHOLE HOUSE"     :rem 242
110 GET A$:IF A$<"0" OR A$>"9" THEN 110
                                    :rem 55
120 PRINT "{CLR}"                   :rem 247
130 A=VAL(A$)                       :rem 171
140 TT=0                            :rem 170
150 PRINT TAB(7)"INVENTORY--";R$(A)"
    {DOWN}"                         :rem 134
160 RESTORE:FOR I=1 TO 9:READ D$:NEXT
                                    :rem 166
170 READ ROOM,ITEM$,C               :rem 223
180 IF ROOM=10 THEN 250             :rem 201
190 IF A=0 THEN 210                 :rem 153
200 IF ROOM<>A THEN 170             :rem 224
210 C$=STR$(C)                      :rem 232
220 PRINT ITEM$;TAB(36-LEN(C$));C$
                                    :rem 166
230 TT=TT+C                         :rem 144
240 GOTO 170                        :rem 103
250 T$=STR$(TT)                      :rem 98
260 PRINT "{DOWN}TOTAL";TAB(36-LEN(T$));T
    $                               :rem 82
270 PRINT "{DOWN}DIFFERENT ROOM? (Y/N)";
                                    :rem 240
280 GET A$:IF A$="Y" THEN 60        :rem 124
290 IF A$="N" THEN 520               :rem 36
300 GOTO 280                        :rem 102
310 REM INVENTORY ITEMS             :rem 200
320 DATA 3,BED--BUNK,200             :rem 33
330 DATA 3,BED--DOUBLE,250          :rem 178
340 DATA 3,BED--KING,725             :rem 40
350 DATA 8,COMPUTER,300              :rem 68
360 DATA 7,DESK,130                 :rem 253
370 DATA 6,DINING TABLE,325         :rem 253
380 DATA 5,DRYER,350                 :rem 96
390 DATA 1,LOVESEAT,375              :rem 65
400 DATA 2,MICRO OVEN,450           :rem 131
410 DATA 1,PIANO,9800               :rem 128
420 DATA 8,PRINTER,255                :rem 0
430 DATA 2,REFRIGERATOR,425          :rem 98
440 DATA 1,SOFA,425                 :rem 255
450 DATA 7,STEREO,875               :rem 184
460 DATA 2,STOVE,525                :rem 107
470 DATA 8,TELEVISION--13,225       :rem 158
480 DATA 6,TELEVISION--19,475       :rem 170
490 DATA 7,TYPEWRITER,300           :rem 248
500 DATA 5,WASHING MACHINE,560      :rem 221
510 DATA 10,ZZZ,0                   :rem 167
520 END                             :rem 110
```

Program 2:

Household Inventory—VIC Version

```
10 REM HOUSEHOLD INVENTORY          :rem 190
20 FOR I=1 TO 9:READ R$(I):NEXT     :rem 187
30 DATA LIVING ROOM,KITCHEN,BEDROOMS
                                    :rem 60
40 DATA BATHROOMS,UTILITY ROOM,FAMILY ROO
   M                                :rem 245
50 DATA DEN,COMPUTER ROOM,STORAGE ROOMS
                                    :rem 255
60 PRINT "{CLR}"                    :rem 202
70 PRINT "{3 SPACES}** INVENTORY **"
                                    :rem 174
80 PRINT "{2 DOWN}CHOOSE:{DOWN}"    :rem 103
90 FOR I=1 TO 9:PRINT TAB(4)I;R$(I):NEXT
                                    :rem 19
100 PRINT TAB(5)"0 WHOLE HOUSE"     :rem 242
110 GET A$:IF A$<"0" OR A$>"9" THEN 110
                                    :rem 55
120 PRINT "{CLR}"                   :rem 247
130 A=VAL(A$)                       :rem 171
140 TT=0                            :rem 170
150 PRINT R$(A)"{DOWN}"             :rem 128
160 RESTORE:FOR I=1 TO 9:READ D$:NEXT
                                    :rem 166
170 READ ROOM,ITEM$,C               :rem 223
180 IF ROOM=10 THEN 250             :rem 201
190 IF A=0 THEN 210                 :rem 153
200 IF ROOM<>A THEN 170             :rem 224
210 C$=STR$(C)                      :rem 232
220 PRINT ITEM$;TAB(20-LEN(C$));C$
                                    :rem 159
230 TT=TT+C                         :rem 144
240 GOTO 170                        :rem 103
250 T$=STR$(TT)                      :rem 98
260 PRINT "{DOWN}TOTAL";TAB(20-LEN(T$));T
    $                               :rem 75
270 PRINT "{DOWN}DIFFERENT ROOM? (Y/N)";
                                    :rem 240
280 GET A$:IF A$="Y" THEN 60        :rem 124
290 IF A$="N" THEN 520               :rem 36
300 GOTO 280                        :rem 102
310 REM INVENTORY ITEMS             :rem 200
320 DATA 3,BED--BUNK,200             :rem 33
330 DATA 3,BED--DOUBLE,250          :rem 178
340 DATA 3,BED--KING,725             :rem 40
350 DATA 8,COMPUTER,300              :rem 68
360 DATA 7,DESK,130                 :rem 253
370 DATA 6,DINING TABLE,325         :rem 253
380 DATA 5,DRYER,350                 :rem 96
390 DATA 1,LOVESEAT,375              :rem 65
400 DATA 2,MICRO OVEN,450           :rem 131
410 DATA 1,PIANO,9800               :rem 128
420 DATA 8,PRINTER,255                :rem 0
430 DATA 2,REFRIGERATOR,425          :rem 98
440 DATA 1,SOFA,425                 :rem 255
450 DATA 7,STEREO,875               :rem 184
460 DATA 2,STOVE,525                :rem 107
470 DATA 8,TELEVISION--13,225       :rem 158
480 DATA 6,TELEVISION--19,475       :rem 170
490 DATA 7,TYPEWRITER,300           :rem 248
500 DATA 5,WASHING MACHINE,560      :rem 221
510 DATA 10,ZZZ,0                   :rem 167
520 END                             :rem 110
```

Program 3:

Computer Inventory—64 Version

```
10 REM COMPUTER INVENTORY           :rem 130
```

```
20 C$(1)="COMMODORE":C$(2)="RADIO SHACK"
                                    :rem 239
30 C$(3)="TEXAS INSTRUMENTS"       :rem 192
40 D$(1)="COMPUTERS":D$(2)="PERIPHERALS":
   D$(3)="SOFTWARE"                 :rem 136
50 PRINT "{CLR}"                    :rem 201
60 PRINT TAB(12)"** INVENTORY **"   :rem 56
70 PRINT "{2 DOWN}CHOOSE:{DOWN}"    :rem 102
80 FOR I=1 TO 3:PRINT TAB(4)I;C$(I):NEXT
                                    :rem 253
90 PRINT TAB(5)"0 EVERYTHING"       :rem 204
100 GET A$:IF A$<"0" OR A$>"3" THEN 100
                                    :rem 47
110 CC=VAL(A$)                      :rem 238
120 PRINT "{2 DOWN}CHOOSE:{DOWN}":rem 146
130 FOR I=1 TO 3:PRINT TAB(4)I;D$(I):NEXT
                                    :rem 42
140 PRINT TAB(5)"0 EVERYTHING":POKE 198,0
                                    :rem 95
150 GET A$:IF A$<"0" OR A$>"3" THEN 150
                                    :rem 57
160 DD=VAL(A$)                      :rem 245
170 PRINT "{CLR}"                   :rem 252
180 TT=0                            :rem 174
190 PRINT C$(CC),D$(DD);"{DOWN}"    :rem 98
200 RESTORE                         :rem 182
210 READ C,D,ITEM$,SN$,DATE$,CST    :rem 86
220 IF C=10 THEN 310                :rem 199
230 IF CC=0 THEN 250                :rem 221
240 IF CC<>C THEN 210               :rem 42
250 IF DD=0 THEN 270                :rem 227
260 IF DD<>D THEN 210               :rem 47
270 C$=STR$(CST)                    :rem 149
280 PRINT ITEM$;TAB(17);SN$;TAB(27);DATE$
    ;TAB(39-LEN(C$));C$             :rem 195
290 TT=TT+CST                       :rem 61
300 GOTO 210                        :rem 95
310 T$=STR$(TT)                     :rem 95
320 PRINT "{DOWN}TOTAL";TAB(39-LEN(T$));T
    $                               :rem 82
330 PRINT "{DOWN}DIFFERENT CATEGORY? (Y/N
    )";                             :rem 14
340 GET A$:IF A$="Y" THEN 50        :rem 120
350 IF A$="N" THEN 550              :rem 36
360 GOTO 340                        :rem 105
370 REM INVENTORY ITEMS             :rem 206
380 DATA 1,1,VIC-20,V029972,1982,225
                                    :rem 100
390 DATA 1,2,DATASETTE,282754,1982,70
                                    :rem 11
400 DATA 1,3,VICMON,,1982,60        :rem 244
410 DATA 1,1,COMMODORE 64,P00144607,1983,
    345                             :rem 83
420 DATA 1,2,1541 DISK DRIVE,K0177958,198
    4,250                           :rem 140
430 DATA 1,2,1525 PRINTER,5016223,1984,25
    0                               :rem 177
440 DATA 1,3,RADAR RAT RACE,,1983,30
                                    :rem 150
450 DATA 2,1,16K COLOR,0024023,1982,620
                                    :rem 234
460 DATA 2,2,CTR-80A RECORDER,,1982,56
                                    :rem 72
470 DATA 2,3,COLOR LOGO,,1983,55    :rem 229
480 DATA 2,3,VIDEOTEX,,1983,40      :rem 152
490 DATA 3,1,TI-9/4,61205,1980,635
                                    :rem 203
500 DATA 3,1,TI-99/4A,40102545,1982,425
                                    :rem 211
510 DATA 3,2,TI RECORDER,025426,1983,60
                                    :rem 82
520 DATA 3,3,ATTACK,5159992,1983,35
                                    :rem 96
530 DATA 3,3,MUNCHMAN,9976273,1982,35
                                    :rem 2
540 DATA 10,0,,,,0                  :rem 80
550 END                             :rem 113
```

Program 4:
Computer Inventory—VIC Version

```
10 REM COMPUTER INVENTORY           :rem 130
20 C$(1)="COMMODORE":C$(2)="RADIO SHACK"
                                    :rem 239
30 C$(3)="TEXAS INSTRUMENTS"       :rem 192
40 D$(1)="COMPUTERS":D$(2)="PERIPHERALS":
   D$(3)="SOFTWARE"                 :rem 136
50 PRINT "{CLR}"                    :rem 201
60 PRINT "{4 SPACES}** INVENTORY **"
                                    :rem 173
70 PRINT "{2 DOWN}CHOOSE:{DOWN}"    :rem 102
80 FOR I=1 TO 3:PRINT I;C$(I):NEXT
                                    :rem 161
90 PRINT " 0 EVERYTHING"            :rem 111
100 GET A$:IF A$<"0" OR A$>"3" THEN 100
                                    :rem 47
110 CC=VAL(A$)                      :rem 238
120 PRINT "{2 DOWN}CHOOSE:{DOWN}":rem 146
130 FOR I=1 TO 3:PRINT I;D$(I):NEXT
                                    :rem 206
140 PRINT " 0 EVERYTHING":POKE 198,0
                                    :rem 2
150 GET A$:IF A$<"0" OR A$>"3" THEN 150
                                    :rem 57
160 DD=VAL(A$)                      :rem 245
170 PRINT "{CLR}"                   :rem 252
180 TT=0                            :rem 174
190 PRINT C$(CC),D$(DD);"{DOWN}"    :rem 98
200 RESTORE                         :rem 182
210 READ C,D,ITEM$,SN$,DATE$,CST    :rem 86
220 IF C=10 THEN 310                :rem 199
230 IF CC=0 THEN 250                :rem 221
240 IF CC<>C THEN 210               :rem 42
250 IF DD=0 THEN 270                :rem 227
260 IF DD<>D THEN 210               :rem 47
270 C$=STR$(CST)                    :rem 149
280 PRINT ITEM$,SN$,DATE$;TAB(20-LEN(C$))
    ;C$"{DOWN}"                     :rem 89
290 TT=TT+CST                       :rem 61
300 GOTO 210                        :rem 95
310 T$=STR$(TT)                     :rem 95
320 PRINT "{DOWN}TOTAL";TAB(20-LEN(T$));T
    $                               :rem 72
330 PRINT "{DOWN}DIFFERENT CATEGORY?
    {3 SPACES}(Y/N)";               :rem 14
340 GET A$:IF A$="Y" THEN 50        :rem 120
350 IF A$="N" THEN 550              :rem 36
360 GOTO 340                        :rem 105
370 REM INVENTORY ITEMS             :rem 206
380 DATA 1,1,VIC-20,V029972,1982,225
                                    :rem 100
390 DATA 1,2,DATASETTE,282754,1982,70
                                    :rem 11
400 DATA 1,3,VICMON,,1982,60        :rem 244
410 DATA 1,1,C-64,P00144607,1983,345
                                    :rem 30
420 DATA 1,2,1541 DRIVE,K0177958,1984,250
                                    :rem 97
430 DATA 1,2,1525 PRINTER,5016223,1984,25
    0                               :rem 177
440 DATA 1,3,RADAR RAT,,1983,30     :rem 123
```

```
450 DATA 2,1,16K COLOR,0024023,1982,620
                                    :rem 234
460 DATA 2,2,RECORDER,,1982,56     :rem 137
470 DATA 2,3,COLOR LOGO,,1983,55   :rem 229
480 DATA 2,3,VIDEOTEX,,1983,40     :rem 152
490 DATA 3,1,TI-9/4,61205,1980,635
                                    :rem 203
500 DATA 3,1,TI-99/4A,40102545,1982,425
                                    :rem 211
510 DATA 3,2,TI RECORDER,025426,1983,60
                                     :rem 82
520 DATA 3,3,ATTACK,5159992,1983,35
                                     :rem 96
530 DATA 3,3,MUNCHMAN,9976273,1982,35
                                      :rem 2
540 DATA 10,0,,,,0                   :rem 80
550 END                             :rem 113
```

SpeedScript Customizer

(Article on page 54.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: The Customizer Boot

```
2 DN=8:PRINT"{CLR} BOOT: {RVS}D{OFF}ISK O
  R {RVS}T{OFF}APE"                 :rem 131
4 GETZ$:IFZ$="T"THENDN=1:GOTO8      :rem 136
6 IFZ$<>"D"THEN4                    :rem 168
8 SYS65517:IFPEEK(781)=22THENPRINT"{CLR}P
  OKE44,39:POKE256*39,0:NEW":GOTO12
                                    :rem 115
10 IFPEEK(781)=40THENPRINT"{CLR}POKE44,48
   :POKE256*48,0:NEW                :rem 99
12 PRINT"{2 DOWN}LOAD"CHR$(34)"CUST.SS"CH
   R$(34)","DN                      :rem 65
14 FORI=631TO635:READN:POKEI,N:NEXT:POKE1
   98,5                             :rem 98
16 DATA19,13,13,33,131              :rem 94
```

Program 2: The Customizer

```
1 IFFL=1THEN52                      :rem 86
10 GOTO16                            :rem 1
12 PRINT"{CLR}"X$"{RVS}SPEEDSCRIPT CUSTOM
   IZER{OFF}"                        :rem 6
14 RETURN                           :rem 69
16 LC=0:BC=1:C$="VIC":P0=129:P1=4674:P2=1
   32:P3=145:SYS65517                :rem 216
18 IFPEEK(781)=40THENC$="C64":X=1:P1=2062
   :P2=103:P3=106                    :rem 211
20 DIMV(20):PRINTCHR$(14):PRINTCHR$(8):IF
   XTHENX$="{9 SPACES}"              :rem 97
22 GOSUB12                           :rem 71
24 PRINTX$"{2 DOWN}CUSTOMIZER WILL NOT"
                                    :rem 147
26 PRINTX$"DESTROY THE SOURCE "     :rem 145
28 PRINTX$"COPY OF SPEEDSCRIPT."    :rem 251
30 PRINTX$"{DOWN}INSERT SOURCE DISK
   {2 SPACES}"                      :rem 18
32 PRINTX$"OR TAPE VERSION OF       :rem 22
34 PRINTX$"SPEEDSCRIPT 1.0 OR"      :rem 42
36 PRINTX$"2.0 FOR {RVS}"C$"{OFF}.
                                    :rem 136
38 PRINTX$"{DOWN}ENTER SOURCE FILENAME."
                                     :rem 7
40 PRINTX$;:INPUT"NAME";NF$         :rem 74
42 PRINTX$"{DOWN}{RVS}D{OFF}ISK OR {RVS}T
   {OFF}APE?"                       :rem 65
44 GETZ$:IFZ$<>"D"ANDZ$<>"T"THEN44  :rem 9
46 IFZ$="T"THEND$="{RVS}TAPE{OFF}":DN=1
                                    :rem 108
48 IFZ$="D"THEND$="{RVS}DISK{OFF}":DN=8
                                    :rem 102
50 FL=1:LOADNF$,DN,1                :rem 146
52 IFXTHENLC=11:BC=12:POKE53280,BC:POKE53
   281,BC                           :rem 67
54 POKE646,LC:IFX=0THENPOKE36879,25
                                    :rem 131
56 PE=PEEK(P1):IFPE=P2ORPE=P0THENV$="V1":
   V=1:IFP1=2062THENPOKE5755,133     :rem 59
58 IFPE=P3THENV$="V2":V=2            :rem 2
60 IFPE<>P0ANDPE<>P2ANDPE<>P3THENPRINT"RE
   AD ERROR.":FORI=1TO2000:NEXT:RUN
                                    :rem 134
62 IFP1=4674THENV=3                 :rem 127
64 PRINTX$"{DOWN}{RVS}"C$" SPEEDSCRIPT
   {RVS}"V$:FORI=1TO2000:NEXTI:PRINT"
   {CLR}"                           :rem 244
66 PRINT"{HOME}"X$"{RVS}SPEEDSCRIPT CUSTO
   MIZER{OFF}"                      :rem 143
68 PRINTX$"{DOWN}{RVS}F1{OFF} CHANGES BAC
   KGROUND"                         :rem 192
70 PRINTX$"{DOWN}{RVS}F3{OFF} CHANGES LET
   TERS"                            :rem 254
72 PRINTX$"{DOWN}{RVS}RETURN{OFF} SETS TH
   E COLORS                         :rem 27
74 PRINTX$"AS DEFAULT COLORS.       :rem 47
76 GETZ$:IFZ$=CHR$(133)THENBC=BC+1AND15:I
   FX=1THENPOKE53281,BC:POKE53280,BC
                                     :rem 0
78 IFZ$=CHR$(133)ANDX=0THENBP=(BCAND15)*1
   6+(BCAND7)+8:POKE36879,BP        :rem 126
80 IFZ$=CHR$(133)THENFORI=0TO200:NEXT:GOT
   O76                              :rem 245
82 IFZ$=CHR$(134)THENLC=LC+1AND15:IFX=0TH
   ENLC=LCAND7                      :rem 223
84 IFZ$=CHR$(134)THENPOKE646,LC:GOTO66
                                    :rem 56
86 IFZ$<>CHR$(13)THEN76             :rem 71
88 GOSUB12                          :rem 83
90 PRINTX$"ORIGINAL DEFAULT{3 SPACES}"
                                    :rem 144
92 PRINTX$"SETTINGS ARE LISTED "    :rem 198
94 PRINTX$"BELOW:"                  :rem 109
96 PRINTX$;:INPUT"LEFT MARGIN{7 SPACES}5
   {3 LEFT}";V(0)                   :rem 200
98 PRINTX$;:INPUT"RIGHT MARGIN{6 SPACES}7
   5{4 LEFT}";V(1)                  :rem 242
100 PRINTX$;:INPUT"PAGE LENGTH{7 SPACES}6
    6{4 LEFT}";V(2)                 :rem 182
102 PRINTX$;:INPUT"TOP MARGIN{8 SPACES}5
    {3 LEFT}";V(3)                  :rem 183
104 PRINTX$;:INPUT"BOTTOM MARGIN
    {5 SPACES}58{4 LEFT}";V(4)      :rem 113
106 PRINTX$;:INPUT"SPACING{11 SPACES}2
    {3 LEFT}";V(5)                  :rem 14
108 PRINTX$;:INPUT"FANFOLD(N=0/Y=1)
    {2 SPACES}1{3 LEFT}";V(6)        :rem 7
110 FORI=1TO9:READJ$:K=I+6          :rem 60
112 PRINTX$"[CTRL] £ "I" ={4 SPACES}"J$;
    :INPUT"{4 LEFT}";V(K)           :rem 76
114 NEXTI                           :rem 30
```

```
116 DATA27,14,15,18,00,00,00,00,00
                                    :rem 143
118 PRINTX$"{RVS}C{OFF}ONTINUE OR {RVS}R
    {OFF}ERUN."                     :rem 239
120 GETZ$:IFZ$="R"THENRUN           :rem 47
122 IFZ$<>"C"THEN120                :rem 101
124 GOSUB12                         :rem 122
126 PRINTX$;:INPUT"{DOWN}NEW FILENAME";NF
    $                               :rem 154
128 IFV=1THENBL=2408:LL=2417:DT=5200
                                    :rem 105
130 IFV=2THENBL=2411:LL=2425:DT=5275
                                    :rem 104
132 IFV=3THENBL=4979:LL=5031:DT=7750
                                    :rem 124
134 POKEBL,BC:POKELL,LC:FORI=0TO15:POKEDT
    +I,V(I):NEXTI                   :rem 245
136 IFDN=1THENPRINTX$"{DOWN}{RVS}PRESS ST
    OP ON TAPE{OFF}"                :rem 116
138 PRINTX$"{DOWN}INSERT DESTINATION
    {2 SPACES}"                     :rem 145
140 PRINTX$D$" TO HOLD"             :rem 20
142 PRINTX$"MODIFIED SPEEDSCRIPT":rem 107
144 PRINTX$"AND PRESS {RVS}RETURN{OFF}."
                                    :rem 248
146 GETZ$:IFZ$<>CHR$(13)ANDZ$<>CHR$(141)T
    HEN146                          :rem 237
148 IFX=0ANDV$="V2"THENV=4          :rem 61
150 ONVGOSUB152,154,156,158:GOTO160:rem 3
152 HS=8:LE=162:HE=27:RETURN        :rem 208
154 HS=8:LE=0:HE=40:RETURN          :rem 100
156 HS=18:LE=108:HE=37:RETURN        :rem 6
158 HS=18:LE=8:HE=38:RETURN         :rem 168
160 PRINT"{CLR}PO43,1:PO44,"HS"     :rem 136
162 PRINT"{2 DOWN}PO45,"LE":PO46,"HE"
                                    :rem 179
164 PRINT"{2 DOWN}SAVE"CHR$(34)NF$CHR$(34
    )","DN                         :rem 233
166 DATA19,13,13,13,33,131          :rem 36
168 POKE198,6:FORI=631TO636:READN:POKEI,N
    :NEXT                           :rem 158
```

Mystery At Marple Manor

(Article on page 104.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: 64 Version

```
9 POKE53280,1:POKE53281,0:S=54272:FORJ=0T
  O24:POKES+J,0:NEXT:POKES+24,15    :rem 35
12 PRINT"{CLR}{6 DOWN}"TAB(7)"{8}{RVS}{*}
   {4 RIGHT}£"                      :rem 121
13 PRINTTAB(7)"{RVS} {*}{2 RIGHT}£ ":PRI
   NTTAB(7)"{RVS}{2 SPACES}{*}£
   {2 SPACES}{OFF} YSTERY"          :rem 238
15 PRINTTAB(7)"{RVS} B{2 SPACES}B ":PRINT
   TAB(7)"{RVS} B{2 SPACES}B ":PRINT"
   {3 UP}"TAB(21)CHR$(142);         :rem 153
24 GOSUB1713:PRINT"AT"              :rem 82
27 PRINT"{DOWN}"TAB(12)"{5}{RVS}{*}
   {4 RIGHT}£":PRINTTAB(12)"{RVS} {*}
   {2 RIGHT}£ "                     :rem 42
28 PRINTTAB(12)"{RVS}{2 SPACES}{*}£
   {2 SPACES}{OFF} ARPLE"           :rem 102
30 PRINTTAB(12)"{RVS} B{2 SPACES}B ":PRIN
   TTAB(12)"{RVS} B{2 SPACES}B " :rem 129
33 PRINT"{UP}"TAB(17)"{4}{RVS}{*}
   {4 RIGHT}£":PRINTTAB(17)"{RVS} {*}
   {2 RIGHT}£ ":PRINTTAB(17)"{RVS}
   {2 SPACES}{*}£{2 SPACES}{OFF} ANOR"
                                    :rem 167
36 PRINTTAB(17)"{RVS} B{2 SPACES}B ":PRIN
   TTAB(17)"{RVS} B{2 SPACES}B " :rem 145
39 GOSUB1713                        :rem 184
42 FORJ=1TO1000:NEXT                :rem 226
45 POKES+5,15:POKES+6,0:POKES+4,129
                                    :rem 57
50 J=1:FORI=1TO15:POKE53281,J:POKE53280,1
   -J                               :rem 31
51 POKES+1,INT(RND(1)*60)+5          :rem 2
53 J=1-J:FORP=1TO30:NEXT:NEXT       :rem 110
56 POKES+4,0                        :rem 168
100 DEFFNR(X)=INT(RND(1)*X)+1:J=RND(-TI)
                                    :rem 108
103 DIMP%(50),S$(22),R$(14),C$(6),V$(3),V
    (3),D%(10,2)                    :rem 56
112 FORJ=1TO10:P%(J)=FNR(11)+3:NEXT
                                    :rem 46
115 FORJ=11TO22:P%(J)=FNR(13)+1:NEXT
                                    :rem 101
118 FORJ=24TO31:P%(J)=4:NEXT        :rem 169
121 P%(23)=FNR(8)+6                 :rem 204
124 J=FNR(10):P%(35)=J:P%(34)=P%(J):P%(J)
    =0                              :rem 16
127 J=FNR(10):IFP%(J)=0THEN127      :rem 200
130 P%(32)=J:P%(J)=0:J=FNR(12):P%(33)=J:P
    %(J+10)=0                       :rem 136
133 FORJ=1TO22:IFRND(1)<=.75THENP%(J)=-P%
    (J)                             :rem 56
136 READS$(J):NEXT                  :rem 65
139 FORJ=1TO14:READR$(J):NEXT       :rem 36
142 FORJ=0TO10:READD%(J,1),D%(J,2):IFRND(
    1)<.9THEND%(J,0)=-1             :rem 122
143 NEXT                            :rem 215
145 FORJ=0TO3:READV$(J):NEXT        :rem 242
148 P=2049:I=0:FORJ=4000TO7000STEP1000
                                    :rem 188
151 IFJ=PEEK(P+2)+PEEK(P+3)*256THENDA(I)=
    P:I=I+1:GOTO157                 :rem 54
154 P=PEEK(P)+PEEK(P+1)*256:GOTO151
                                    :rem 11
157 NEXT                            :rem 220
172 PRINT"{HOME}{21 DOWN}{BLK}{6 SPACES}H
    OW MANY PLAYERS (1-6) ?"        :rem 218
175 GETA$:IFA$<"1"ORA$>"6"THEN175 :rem 75
178 I=VAL(A$):P%(49)=I              :rem 178
181 FORJ=1TOI:P%(35+J)=1:NEXT       :rem 233
190 PRINT"{CLR}{2 DOWN}{4}ALL PLAYERS EXC
    EPT PLAYER #1 MUST LEAVE"CHR$(14)
                                    :rem 7
192 PRINT"THE ROOM AT THIS POINT.":PRINT"
    {DOWN}{3 SPACES}PLAYER # 1: PRESS
    {RVS} RETURN {OFF}"             :rem 152
193 PRINT"{7 SPACES}TO BEGIN THE GAME!"
                                    :rem 146
194 GETA$:IFA$<>CHR$(13)THEN194     :rem 14
196 POKE53280,12:POKE53281,15:Q=1 :rem 87
200 PRINT"{CLR}{2 DOWN}{BLK}PLAYER #"Q"--
    ----------{4}{DOWN}"           :rem 120
203 IFC$(Q)<>""THEN212              :rem 175
```

```
206 PRINT"PRESS ANY TWO KEYS TO ESTABLISH
    YOUR"                              :rem 37
207 PRINT"SECRET CODE. WITH THIS CODE, NO
    OTHER"                             :rem 211
209 PRINT"PLAYER CAN STEAL YOUR TURN!":PR
    INT"{DOWN}ENTER YOUR CODE NOW!"
                                       :rem 214
210 GOSUB1700:C$(Q)=A$:GOTO218         :rem 206
212 PRINT"{DOWN}ENTER YOUR SECRET CODE!":
    GOSUB1700                          :rem 72
215 IFC$(Q)<>A$THENI=0:GOSUB1710:GOTO200
                                       :rem 124
218 PRINT"{CLR}{2 DOWN}{BLK}PLAYER #"Q"--
    ----------{43}{DOWN}"             :rem 129
221 R=P%(35+Q):PRINT"YOU ARE IN THE "R$(R
    )"."                               :rem 49
224 PRINT"DO YOU WISH TO LEAVE THIS ROOM
    {SPACE}[Y/N] ?"                    :rem 6
227 GETA$:IFA$="N"THENPRINT"NO":GOTO330
                                       :rem 3
230 IFA$<>"Y"THEN227                   :rem 106
233 I=1:J=R:GOSUB1730:FORJ=0TO3:READV(J):
    NEXT                               :rem 85
236 PRINT"YES":PRINT"{DOWN}DOORS FROM THI
    S ROOM ARE FOUND TO THE:"          :rem 187
239 FORJ=0TO3:IFV(J)<>0THENPRINTTAB(4);V$
    (J)                                :rem 222
242 NEXT:PRINT"{DOWN}TYPE {RVS}{BLK} N
    {OFF} , {RVS} S {OFF} , {RVS} E {OFF}
    ,{43}OR {RVS}{BLK} W {OFF}{43} TO MOVE
    !":I=3                             :rem 227
245 GETA$:IFA$=""THEN245               :rem 89
248 A=ASC(A$)OR128:I=0:IFA<197ORA>215THEN
    245                                :rem 62
251 IFA=ASC(V$(I))THEN260              :rem 168
254 I=I+1:IFI<4THEN251                 :rem 15
257 GOTO245                            :rem 114
260 PRINT"GO "V$(I)                    :rem 147
261 IF V(I)<1THENPRINT"NO DOOR THIS WAY.
    {SPACE}YOU CAN'T MOVE.":GOTO1910
                                       :rem 154
263 IFV(I)<100THENR=V(I):PRINT"MOVING TO
    {SPACE}NEW ROOM.":FORI=1TO10000:NEXT:G
    OTO330                             :rem 166
266 Z=V(I)-100:IFD%(Z,0)=0THEN300      :rem 75
269 PRINT"THAT DOOR IS LOCKED":GOSUB1760
                                       :rem 45
270 IFA=0THENPRINT"YOU DON'T HAVE A MATCH
    ING KEY.":PRINT"NO MOVE.":GOTO1910
                                       :rem 65
272 PRINT"YOUR KEY OPENS THE DOOR.":GOSUB
    1770:PRINT"MOVING TO NEW ROOM."
                                       :rem 200
300 I=D%(Z,1):IFI=RTHENI=D%(Z,2)       :rem 82
303 R=I:GOSUB1760:IFA<>1THEN330        :rem 112
306 PRINT"DO YOU WANT TO LOCK THIS DOOR B
    EHIND{4 SPACES}YOU{2 SPACES}[Y / N] ?
    "                                  :rem 96
309 GETA$:IFA$="N"THENPRINT"NO":GOTO330
                                       :rem 4
312 IFA$<>"Y"THEN309                   :rem 108
315 PRINT"YES":GOSUB1770:PRINT"DOOR LOCKE
    D."                                :rem 3
330 P%(Q+35)=R:PRINT"{DOWN}{CLR}{5 DOWN}Y
    OU ARE IN THE "R$(R)"."            :rem 43
333 PRINT"YOU CARRY ";:I=P%(Q+41):GOSUB17
    80:PRINT"."                        :rem 205
336 J=0:PRINT"YOU SEE THE FOLLOWING HERE:
    "                                  :rem 168
339 FORI=1TO31:IFP%(I)=RTHENJ=J+1:PRINT"
    {3 SPACES}";:GOSUB1780:PRINT"."
                                       :rem 16
342 NEXT:FORI=1TO6:IFI<>QANDP%(35+I)=RTHE
    NPRINT"{3 SPACES}PLAYER #"I".":J=J+1
                                       :rem 252
345 NEXT:IFP%(34)=RTHENPRINT"{3 SPACES}TH
    E BODY OF THE "S$(P%(35))".":J=J+1
                                       :rem 180
348 IFJ=0THENPRINT"NOTHING OF INTEREST."
                                       :rem 173
351 PRINT"{DOWN}PRESS {RVS}{BLK} RETURN
    {SHIFT-SPACE}{OFF}{43} FOR OPTIONS....
    "                                  :rem 158
354 GETA$:IFA$<>CHR$(13)THEN354        :rem 10
375 PRINT"{CLR}"                       :rem 3
376 PRINT"{4 DOWN}{BLK}{3 SPACES}>>>>> TU
    RN{SHIFT-SPACE}OPTIONS <<<<<{2 DOWN}"
    :PRINT" {43}{RVS}A{OFF} ACCUSE THE MUR
    DERER!"                            :rem 129
377 PRINT"{SHIFT-SPACE}{RVS}D{OFF} DROP A
    N ITEM.":PRINT" {RVS}H{OFF} HIDE AN I
    TEM OR SUSPECT."                   :rem 224
379 PRINT" {RVS}N{OFF} NO ACTION.":PRINT"
     {RVS}P{OFF} PILFER FROM ANOTHER PLAY
    ER."                               :rem 240
381 PRINT" {RVS}S{OFF} SEARCH THE ROOM FO
    R HIDDEN ITEMS.":PRINT" {RVS}T{OFF} T
    AKE AN ITEM."                      :rem 143
384 PRINT"{2 DOWN}ENTER LETTER FOR ACTION
     DESIRED!{3 DOWN}"                 :rem 89
387 GETA$:IFA$<"A"ORA$>"T"THEN387:rem 131
390 PRINT"{CLR}":A=ASC(A$):ONA-64GOTO700,
    387,387,800                        :rem 36
393 IFA$="H"THEN970                    :rem 43
396 IFA$<"N"THEN387                    :rem 53
400 ONA-77GOTO450,387,880,398,387,930,820
                                       :rem 165
450 PRINT"{2 DOWN}PRESS {RVS}{BLK} RETURN
     {OFF}{43} TO END YOUR TURN!"      :rem 119
453 GETA$:IFA$<>CHR$(13)THEN453        :rem 10
456 I=0:PRINT"{BLK}{CLR}{4 DOWN}PLAYER #"
    Q"========== END TURN":GOSUB1710
                                       :rem 142
459 Q=Q+1:IFQ>P%(49)THENQ=1            :rem 86
462 IFP%(Q+35)=0THEN459                :rem 19
465 GOTO200                            :rem 106
700 PRINT"{CLR}{DOWN}{BLK}{3 SPACES}*****
     MAKE AN ACCUSATION *****{DOWN}{43}":I
    =1                                 :rem 112
703 FORJ=1TO10:PRINTJ"{LEFT}:"TAB(5)"THE
    {SPACE}";S$(J)".":NEXT             :rem 163
706 PRINT"{3 DOWN}ENTER NUMBER OF MURDER
    {SPACE}VICTIM ";:INPUTJ            :rem 231
709 IFJ<>P%(35)THENI=0                 :rem 6
712 GOSUB1900                          :rem 228
715 FORJ=1TO10:PRINTJ"{LEFT}:"TAB(5)"THE
    {SPACE}";S$(J)".":NEXT             :rem 166
718 PRINT"{3 DOWN}ENTER NUMBER OF MURDERE
    R ";:INPUTJ                        :rem 53
721 IFJ<>P%(32)THENI=0                 :rem 253
724 GOSUB1900                          :rem 231
727 FORJ=1TO12:PRINTJ"{LEFT}:"TAB(5)"THE
    {SPACE}"S$(J+10)".":NEXT           :rem 252
730 PRINT"{3 DOWN}ENTER NUMBER OF MURDER
    {SPACE}WEAPON ";:INPUTJ            :rem 226
733 IFJ<>P%(33)THENI=0                 :rem 1
736 GOSUB1900                          :rem 234
739 FORJ=1TO14:PRINTJ"{LEFT}:"TAB(5)"THE
    {SPACE}"R$(J)".":NEXT              :rem 116
742 PRINT"{3 DOWN}ENTER NUMBER OF MURDER
    {SPACE}ROOM ";:INPUTJ              :rem 88
745 IFJ<>ABS(P%(34))THENI=0            :rem 44
746 PRINT"{CLR}{5 DOWN}SUMMONING THE POLI
```

```
CE TO MAKE AN":PRINT"ARREST....."
                                    :rem 244
748 POKES+14,5:POKES+18,16:POKES+3,1:POKE
    S+24,143:POKES+6,240:POKES+4,65:A=538
    9                               :rem 163
751 FORJ=1TO200:R=A+PEEK(S+27)*3.5:POKES,
    RAND255:POKES+1,INT(R/256):NEXT
                                    :rem 131
754 FORJ=0TO24:POKES+J,0:NEXT:POKES+24,15
                                    :rem 44
757 FORJ=1TO2500:NEXT               :rem 37
760 IFI=0THEN772                    :rem 177
763 I=3:PRINT"YOUR SOLUTION IS CORRECT!":
    GOSUB1710                       :rem 2
769 PRINT"{2 DOWN}PLAYER #"Q"HAS CRACKED
    {SPACE}THE CASE!":GOTO787       :rem 158
772 I=2:PRINT"NO!...THAT WAS A FALSE ARRE
    ST!":GOSUB1710                  :rem 232
775 GOSUB1800:P%(35+Q)=0:P%(50)=P%(50)+1:
    PRINT"YOU'RE OUT OF THE GAME!":rem 85
778 IFP%(50)<P%(49)THEN450          :rem 151
781 RESTORE:GOSUB1713:FORJ=1TO500:NEXT:GO
    SUB1713                         :rem 90
784 PRINT"{DOWN}ALL PLAYERS HAVE GIVEN IN
    CORRECT":PRINT"SOLUTIONS TO THE CRIME
    !!"                             :rem 85
785 PRINT"{DOWN}NOBODY WINS !"      :rem 51
787 PRINT"HERE IS THE CORRECT SOLUTION:":
    PRINT"THE "S$(P%(32))           :rem 192
789 PRINT"KILLED THE "S$(P%(35)):PRINT"IN
     THE "R$(ABS(P%(34)))","        :rem 19
791 PRINT"USING THE "S$(P%(33)+10)".
    {2 DOWN}":END                   :rem 254
800 PRINT"{2 DOWN}{BLK}{3 SPACES}*** DROP
     AN ITEM ***{43}":GOSUB1800     :rem 36
803 IFI=0THENPRINT"{DOWN}YOU WEREN'T CARR
    YING ANYTHING !":GOTO450        :rem 88
806 PRINT"{DOWN}YOU DROP ";:GOSUB1780:PRI
    NT".":GOTO450                   :rem 60
820 PRINT"{2 DOWN}{BLK}{3 SPACES}*** TAKE
     AN ITEM ***{43}":J=1:PRINT"{DOWN}THES
    E ITEMS ARE AVAILABLE:"         :rem 175
823 FORI=11TO31:IFP%(I)<>RTHEN829:rem 233
826 PRINTJ": ";:GOSUB1780:PRINT".":POKE90
    0+J,I:J=J+1                     :rem 70
829 NEXT:IFJ=1THENPRINT"NO ITEMS.":GOTO45
    0                               :rem 60
832 PRINT"{DOWN}ENTER NUMBER TO TAKE AN I
    TEM, OR":PRINT"ENTER ZERO TO TAKE NOT
    HING."                          :rem 111
835 INPUT"WHAT ITEM DO YOU WANT";A:IFA<0O
    RA>=JTHEN835                    :rem 137
838 IFA=0THENPRINT"{DOWN}NO ITEM TAKEN.":
    GOTO450                         :rem 234
841 GOSUB1800:IFI<>0THENPRINT"YOU DROP ";
    :GOSUB1780:PRINT"."             :rem 82
844 I=PEEK(900+A):P%(I)=100+Q:P%(Q+41)=I
                                    :rem 155
845 PRINT"YOU TAKE ";:GOSUB1780:PRINT".":
    GOTO450                         :rem 30
880 PRINT"{2 DOWN}{BLK}{3 SPACES}*** PILF
    ER FROM ANOTHER ***{43}":J=0    :rem 46
881 PRINT"{DOWN}THESE PLAYERS ARE ALSO IN
     THE ROOM..."                   :rem 226
883 FORI=1TO6:IFP%(35+I)=RANDI<>QTHENPRIN
    T"{3 SPACES}PLAYER #"I".":J=J+1
                                    :rem 141
886 NEXT:IFJ=0THENPRINT"NO OTHER PLAYERS
    {SPACE}ARE IN THE ROOM!":GOTO450
                                    :rem 222
889 PRINT"{DOWN}WHICH PLAYER WILL YOU STE
    AL FROM ?"                      :rem 108
890 PRINT"ENTER NUMBER, OR PRESS ZERO."
                                    :rem 1
892 INPUT"PILFER FROM PLAYER #";A:IFA<0OR
    A>P%(49)THEN889                 :rem 250
893 IFA=0THENPRINT"NO THEFT.":GOTO450
                                    :rem 179
895 IFA=QTHENPRINT"YOU CAN'T STEAL FROM Y
    OURSELF!":GOTO892               :rem 43
898 IFP%(35+A)<>RTHENPRINT"PLAYER #"A"IS
    {SPACE}NOT HERE !":GOTO889      :rem 129
901 GOSUB1800:IFI<>0THENPRINT"YOU DROP ";
    :GOSUB1780:PRINT"."             :rem 79
904 I=P%(A+41):IFI=0THENPRINT"PLAYER #"A"
    CARRIED NO ITEM!":GOTO450       :rem 33
907 P%(Q+41)=I:P%(A+41)=0:P%(I)=100+Q
                                    :rem 158
908 PRINT"YOU TAKE ";:GOSUB1780:PRINT".":
    GOTO450                         :rem 30
930 PRINT"{2 DOWN}{BLK}{3 SPACES}*** SEAR
    CH THE ROOM ***{43}":J=0:PRINT"{DOWN}Y
    OU FIND THE FOLLOWING:"         :rem 125
933 FORI=1TO31:IFP%(I)<>-RTHEN942:rem 227
936 IFRND(1)>.5THEN942              :rem 6
939 J=J+1:PRINTTAB(4);:GOSUB1780:PRINT".
    :P%(I)=R                        :rem 203
942 NEXT:IFP%(34)<>-RORRND(1)>.5THEN948
                                    :rem 73
945 J=1:PRINT"{4 SPACES}THE BODY OF THE "
    S$(P%(35))".":P%(34)=R          :rem 200
948 IFJ=0THENPRINT"{2 SPACES}------NOTHIN
    G !"                            :rem 177
951 GOTO450                         :rem 113
970 PRINT"{2 DOWN}{BLK}{3 SPACES}*** HIDE
     ITEM OR SUSPECT ***{43}":J=1   :rem 57
971 PRINT"{DOWN}THESE CAN BE HIDDEN:"
                                    :rem 187
973 FORI=1TO31:IFP%(I)<>RTHEN979 :rem 196
976 PRINTJ": ";:GOSUB1780:PRINT".":POKE90
    0+J,I:J=J+1                     :rem 76
979 NEXT:I=P%(Q+41):IFI=0THEN985 :rem 163
982 PRINTJ": ";:GOSUB1780:PRINT" (YOU CAR
    RY IT).":POKE900+J,Q+41:J=J+1 :rem 77
985 IFP%(34)=RTHENPRINTJ": THE BODY OF TH
    E "S$(P%(35))".":POKE900+J,34:J=J+1
                                    :rem 211
988 IFJ=1THENPRINT"NOTHING HERE CAN BE HI
    DDEN!":GOTO450                  :rem 221
991 PRINT"{DOWN}ENTER NUMBER OF ITEM TO H
    IDE, OR":PRINT"ENTER ZERO TO HIDE NOT
    HING."                          :rem 101
994 INPUT"WHAT WILL YOU HIDE";A:IFA<0ORA>
    =JTHEN994                       :rem 235
997 IFA=0THENPRINT"NOTHING HIDDEN.":GOTO4
    50                              :rem 99
1000 I=PEEK(900+A):IFI>34THEN1009:rem 114
1003 P%(I)=-R:IFI=34THENPRINT"YOU HIDE TH
    E BODY.":GOTO450                :rem 37
1006 PRINT"YOU HIDE ";:GOSUB1780:PRINT".":
    :GOTO450                        :rem 57
1009 I=P%(Q+41):PRINT"YOU HIDE THE OBJECT
     YOU CARRY....":GOSUB1780:PRINT"."
                                    :rem 42
1012 P%(Q+41)=0:P%(I)=-R:GOTO450 :rem 233
1700 GETA$:IFA$=""THEN1700          :rem 179
1703 GETB$:IFB$=""THEN1703          :rem 187
1706 A$=A$+B$:RETURN                :rem 128
1710 J=1:GOSUB1730                   :rem 6
1713 READW,I,J:POKES+2,I:POKES+3,J:READI,
    J:POKES+5,I:POKES+6,J           :rem 129
1716 READZ:IFZ<0THENRETURN          :rem 227
```

```
1719 POKES+1,INT(Z/256):POKES,ZAND255:REA
     DZ:POKES+4,W                    :rem 61
1722 FORJ=1TOZ*100:NEXT:POKES+4,0:GOTO171
     6                               :rem 85
1730 P=DA(I):IFJ=1THEN1736           :rem 248
1733 FORI=1TOJ-1:P=PEEK(P)+PEEK(P+1)*256:
     NEXT                            :rem 209
1736 P=P-1:POKE66,INT(P/256):POKE65,PAND2
     55:RETURN                       :rem 62
1760 A=0:I=P%(41+Q):IFI<23ORI>31THENRETUR
     N                               :rem 49
1763 IFI=23THENA=-1:RETURN           :rem 112
1766 I=I-17:IFI=D%(Z,1)ORI=D%(Z,2)THENA=1
                                     :rem 111
1769 RETURN                          :rem 183
1770 IFD%(Z,0)=0THEND%(Z,0)=-1:RETURN
                                     :rem 143
1773 D%(Z,0)=0:RETURN                :rem 201
1780 IFI=0THENPRINT"NO ITEM";:RETURN
                                     :rem 54
1783 IFI<23THENPRINT"THE "S$(I);:RETURN
                                     :rem 147
1786 IFI=23THENPRINT"THE SKELETON KEY";:R
     ETURN                           :rem 212
1789 PRINT"THE "R$(I-17)" KEY";:RETURN
                                     :rem 50
1800 I=P%(Q+41):IFI=0THENRETURN      :rem 132
1803 R=P%(Q+35):P%(I)=R:P%(Q+41)=0:RETURN
                                     :rem 69
1900 PRINT"{CLR}{DOWN}{BLK}{3 SPACES}****
     * MAKE AN ACCUSATION *****{DOWN}{43}"
     :RETURN                         :rem 204
1910 FORI=1TO2200:NEXT:GOTO330       :rem 82
2000 DATA17,0,0,0,240,14435,1,12860,1,144
     35,7,0,4                        :rem 122
2005 DATA12860,1,11457,1,10814,1,9634,1,9
     094,6,9634,8,0,8,-1             :rem 196
2020 DATA17,0,0,0,240,7217,1,6430,1,7217,
     8,0,7                           :rem 236
2025 DATA5407,6,5728,6,4547,6,4817,24,-1
                                     :rem 247
3000 DATA"COOK","BUTLER","GARDENER","CHAU
     FFER","DUKE","DUCHESS","NANNY"
                                     :rem 131
3005 DATA"OPERA STAR","AMBASSADOR","PRIME
      MINISTER","CARVING KNIFE","ROPE"
                                     :rem 9
3010 DATA"BOX OF WEED KILLER","ANTIQUE MA
     CE","DUELLING PISTOL","FENCING FOIL"
                                     :rem 216
3015 DATA"ICE PICK","PLASTIC BAG","CHAIN
     {SPACE}SAW","HEDGE TRIMMERS","POLO M
     ALLET"                          :rem 208
3020 DATA"GARDEN SPADE","ENTRY FOYER","CO
     RRIDOR","HALL","PANTRY","DINING ROOM
     "                               :rem 97
3025 DATA"KITCHEN","STUDY","BEDROOM","BAT
     HROOM","CLOSET","GREENHOUSE","GARDEN
     "                               :rem 187
3030 DATA"POOL","GARAGE",2,13,2,14,3,7,3,
     8,3,11,7,9,8,9,8,10,11,12,12,13,13,1
     4                               :rem 163
3035 DATA"NORTH","EAST","SOUTH","WEST"
                                     :rem 7
4000 DATA33,0,0,88,89,1804,6,2025,3,2145,
     6,2703,3                        :rem 149
4005 DATA2408,1,2551,1,2408,1,2551,1,2408
     ,1,2551,1,2408,1,2551,1,2703,8,-1
                                     :rem 81
5000 DATA5,3,0,2                     :rem 45
5005 DATA4,1,101,100                 :rem 240
5010 DATA104,103,102,1               :rem 81
5015 DATA0,6,2,0                     :rem 49
5020 DATA6,0,1,0                     :rem 44
5025 DATA0,0,5,4                     :rem 51
5030 DATA102,105,0,0                 :rem 239
5035 DATA0,107,106,103               :rem 94
5040 DATA106,0,0,105                 :rem 244
5045 DATA0,0,0,107                   :rem 148
5050 DATA0,0,104,108                 :rem 246
5055 DATA0,108,109,0                 :rem 0
5060 DATA109,100,0,110               :rem 86
5065 DATA101,110,0,0                 :rem 242
6000 DATA65,255,0,9,0,1804,6,1804,4.4,180
     4,1.5,1804,6,2145,4.5,2025,1.5
                                     :rem 202
6005 DATA2025,4.5,1804,1.5,1804,4.5,1804,
     1.5,1804,12,-1                  :rem 177
7000 DATA33,0,0,88,89,2408,4,3215,12,3608
     ,1.33,2408,1.33,3608,1.33       :rem 223
7005 DATA4050,4,4050,4,4050,4,4050,1.33,4
     291,1.33,3215,1.33              :rem 116
7010 DATA4050,6,3608,2,3215,8,-1     :rem 77
```

Program 2: Mystery At Marple Manor —VIC Version

```
5 POKE36879,29:PRINT"{CLR}{BLK}{5 DOWN}
  {2 RIGHT}MYSTERY AT"CHR$(14):PRINTTAB(7
  )"{2 DOWN}MARPLE"                  :rem 159
10 PRINTTAB(12)"{2 DOWN}MANOR"       :rem 220
100 D$="NESW":T$="EC@BDAMKHGA@FB@F@A@@@E
    DCI@@@JICH@@G@@@H@@CL@KM@LB@NBM@@"
                                     :rem 210
105 DEFFNR(X)=INT(RND(1)*X)+1:J=RND(-TI):
    DIMP%(39)                        :rem 183
110 FORJ=0TO21:P%(J)=FNR(13)+1:NEXT:J=FNR
    (10)-1                           :rem 228
115 P%(25)=J+1:P%(24)=P%(J):P%(J)=0
                                     :rem 17
120 I=FNR(10)-1:IFI=JTHEN120         :rem 106
125 P%(22)=I+1:P%(I)=0:J=FNR(12):P%(23)=J
    :P%(9+J)=0                       :rem 188
130 FORJ=0TO21:IFRND(1)<.8THENP%(J)=-P%(J
    )                                :rem 194
135 NEXT:PRINT"{DOWN}{3 RIGHT}{2 DOWN}
    {BLU}PLAYERS (1-6)?"             :rem 80
140 GETA$:J=VAL(A$):IFJ<1ORJ>6THEN140
                                     :rem 215
145 P%(38)=J:FORI=1TOJ:P%(25+I)=1:NEXT:Q=
    1                                :rem 210
200 PRINT"{CLR}{BLK}{3 DOWN}PLAYER #"Q:PR
    INTCHR$(142)"---PRESS {RVS}RETURN"
                                     :rem 244
205 GETA$:IFA$<>CHR$(13)THEN205      :rem 0
210 R=P%(Q+25):PRINT"{DOWN}YOU ARE IN":PR
    INT"THE ";:X=R+22:GOSUB3000      :rem 167
215 PRINT"LEAVE? [Y/N]"              :rem 163
220 GETA$:IFA$="N"THEN275            :rem 163
225 IFA$<>"Y"THEN220                 :rem 103
230 C$=MID$(T$,4*R-3,4):PRINT"EXITS ARE T
    O THE:{DOWN}"                    :rem 219
235 FORI=1TO4:X=I+36:IFMID$(C$,I,1)>"@"TH
    ENGOSUB3000                      :rem 64
240 NEXT:PRINT"{DOWN}TYPE {RVS}N{RIGHT}S
    {RIGHT}E{OFF} OR {RVS}W":I=0     :rem 241
245 GETA$:IFA$<"E"THEN245            :rem 157
250 FORJ=1TO4:IFMID$(D$,J,1)=A$THENI=J
                                     :rem 1
255 NEXT:IFI=0THEN245                :rem 36
260 X=36+I:PRINT"MOVING ";:GOSUB3000:A$=M
    ID$(C$,I,1)                      :rem 1
```

```
265 I=ASC(A$)-64:IFI<1THENPRINT"NO DOOR":
    PRINT"NO MOVE":GOSUB4050:GOTO275
                                    :rem 10
270 R=I:P%(Q+25)=I                  :rem 218
275 GOSUB4050                       :rem 231
276 PRINT"{CLR}{2 DOWN}YOU ARE IN":PRINT"
    THE ";:X=R+22:GOSUB3000         :rem 229
280 PRINT"YOU HAVE";:X=P%(31+Q)+1:IFX=1TH
    ENPRINT" NO ITEM":GOTO290       :rem 1
285 PRINT" THE ";:GOSUB3000         :rem 9
290 P=0:PRINT"YOU SEE:":FORI=0TO21:rem 84
295 IFP%(I)=RTHENX=I+1:PRINT"THE ";:GOSUB
    3000:P=1                        :rem 210
300 NEXT:IFP%(24)=RTHENGOSUB3100:P=1
                                    :rem 193
305 FORJ=1TO6:IFJ<>QANDP%(J+25)=RTHENPRIN
    T"PLAYER"J:P=1                  :rem 1
310 NEXT:IFP=0THENPRINT"NOTHING!":rem 145
315 INPUT"{DOWN}PRESS {RVS}RETURN{WHT}";A
    $                               :rem 162
400 PRINT"{CLR}{DOWN}{BLK}{3 SPACES}OPTIO
    NS:{2 SPACES}"                  :rem 255
401 PRINT"{DOWN}{BLU}1 ACCUSE":PRINT"2 DR
    OP":PRINT"3 TAKE":PRINT"4 SEARCH"
                                    :rem 69
405 PRINT"5 PILFER":PRINT"6 NO ACTION":PR
    INT"{DOWN}{BLK}CHOOSE NOW!"     :rem 127
415 GETA$:I=VAL(A$):ONIGOTO600,700,750,80
    0,850,500                       :rem 0
420 GOTO415                         :rem 105
500 INPUT"{DOWN}PRESS {RVS}RETURN{WHT}";A
    $                               :rem 158
505 Q=Q+1:IFQ>P%(38)THENQ=1         :rem 76
510 IFP%(Q+25)=0THEN505             :rem 4
515 GOTO200                         :rem 102
600 P=1:W=0:Z=10:GOSUB3200:INPUT"{DOWN}VI
    CTIM";J:IFJ<>P%(25)THENP=0      :rem 25
605 GOSUB3200:INPUT"{DOWN}MURDERER";J:IFJ
    <>P%(22)THENP=0                 :rem 141
610 W=10:Z=12:GOSUB3200:INPUT"{DOWN}WEAPO
    N";J:IFJ<>P%(23)THENP=0         :rem 81
615 W=22:Z=14:GOSUB3200:INPUT"{DOWN}SCENE
    ";J:IFJ<>ABS(P%(24))THENP=0     :rem 39
650 IFPTHENPRINT"{CLR}{3 DOWN}THAT'S RIGH
    T!":PRINT"YOU WIN!":GOTO670     :rem 177
655 PRINT"{CLR}{2 DOWN}WRONG SOLUTION!":P
    RINT"{DOWN}YOU LOSE!"           :rem 190
660 P%(25+Q)=0:P%(39)=P%(39)+1:GOSUB3300:
    IFP%(39)<P%(38)THEN500          :rem 149
665 PRINT"{DOWN}ALL PLAYERS HAVE LOST!"
                                    :rem 3
670 PRINT"{DOWN}{RED}THE SOLUTION:":PRINT
    "{BLK}{DOWN}THE ";:X=P%(22):GOSUB3000
                                    :rem 113
673 PRINT"KILLED THE ";:X=P%(25):GOSUB300
    0                               :rem 187
675 PRINT"IN THE ";:X=22+ABS(P%(24)):GOSU
    B3000                           :rem 84
678 PRINT"WITH THE ";:X=P%(23)+10:GOSUB30
    00:END                          :rem 226
700 GOSUB3300:IFX=0THENPRINT"DROP NO ITEM
    ":GOTO500                       :rem 116
705 PRINT"YOU DROP THE ";:GOSUB3000:GOTO5
    00                              :rem 64
750 P=1:PRINT"AVAILABLE:":FORI=10TO21:IFP
    %(I)=RTHENGOSUB3400             :rem 11
760 NEXT:IFP=1THENPRINT"NO ITEMS":GOTO500
                                    :rem 138
765 INPUT"CHOOSE";Z:IFZ<0ORZ>=PTHEN765
                                    :rem 242
770 IFZ=0THENPRINT"TAKE NOTHING":GOTO500
                                    :rem 56
775 GOSUB3300:IFX>0THENPRINT"DROP THE ";:
    GOSUB3000                       :rem 70
780 I=PEEK(900+Z):P%(I)=100+Q:P%(Q+31)=I:
    X=I+1:PRINT"YOU TAKE THE ";:GOSUB3000
    :GOTO500                        :rem 244
800 P=0:PRINT"{DOWN}YOU FIND:":FORI=0TO21
    :IFP%(I)<>-RORRND(1)>.6THEN810
                                    :rem 232
805 P=1:PRINT"THE ";:X=I+1:GOSUB3000:P%(I
    )=R                             :rem 75
810 NEXT:IFP%(24)=-RANDRND(1)<.6THENP=1:G
    OSUB3100:P%(24)=R               :rem 194
820 IFP=0THENPRINT"--NOTHING"       :rem 87
825 GOTO500                         :rem 109
850 P=0:PRINT"{DOWN}NOW HERE:":FORI=1TO6:
    IFP%(25+I)=RANDI<>QTHENPRINT"PLAYER #
    "I:P=1                          :rem 138
860 NEXT:IFP=0THENPRINT"NOBODY!":GOTO500
                                    :rem 87
865 INPUT"STEAL FROM WHOM";W:IFW<0ORW>P%(
    38)THEN865                      :rem 182
870 IFP%(25+W)<>RTHENPRINT"NOT HERE!":GOT
    O865                            :rem 245
875 GOSUB3300:IFX>0THENPRINT"DROP THE ";:
    GOSUB3000                       :rem 71
880 P=P%(W+31):IFP=0THENPRINT"NOTHING TAK
    EN":GOTO500                     :rem 241
885 P%(Q+31)=P:P%(W+31)=0:P%(P)=100+Q:X=P
    +1:PRINT"YOU TAKE THE ";:GOSUB3000:GO
    TO500                           :rem 14
3000 FORJ=1TOX:READX$:NEXT:PRINTX$:RESTOR
     E:RETURN                       :rem 99
3100 X=P%(25):PRINT"THE BODY OF":PRINT"TH
     E ";:GOSUB3000:RETURN          :rem 243
3200 PRINT"{CLR}{BLK}":FORI=1TOZ:X=I+W:PR
     INTITAB(4)": THE ";:GOSUB3000:NEXT:R
     ETURN                          :rem 62
3300 I=P%(Q+31):X=0:IFI=0THENRETURN
                                    :rem 127
3305 P%(I)=R:P%(Q+31)=0:X=I+1:RETURN
                                    :rem 68
3400 PRINTPTAB(4)":THE ";:X=I+1:GOSUB3000
     :POKE900+P,I:P=P+1:RETURN      :rem 10
4000 DATACOOK,BUTLER,GARDENER,DOCTOR,DUKE
     ,DUCHESS,NANNY,"FILM STAR"     :rem 129
4005 DATASENATOR,JUDGE,KNIFE,ROPE,POISON,
     MACE,PISTOL,SWORD,"ICE PICK"   :rem 5
4010 DATABOMB,RAZOR,LAMP,CLUB,SHOVEL,FOYE
     R,CORRIDOR,HALL,PANTRY,"DINING ROOM"
                                    :rem 92
4015 DATAKITCHEN,STUDY,BEDROOM,BATHROOM,C
     LOSET,GREENHOUSE,GARDEN,POOL:rem 197
4020 DATAGARAGE,NORTH,EAST,SOUTH,WEST
                                    :rem 197
4050 FORI=1TO1200:NEXT:RETURN       :rem 96
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80-Columns

(Article on page 48.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Screen-80

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49152 :011,008,000,000,158,050,227
49158 :048,054,049,000,000,000,157
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49164 :160,044,185,065,008,153,115
49170 :198,002,136,192,255,208,241
49176 :245,160,000,169,160,133,123
49182 :252,132,251,169,008,133,207
49188 :254,169,109,133,253,177,107
49194 :253,145,251,200,208,249,068
49200 :165,252,201,173,240,007,062
49206 :230,254,230,252,076,042,114
49212 :008,076,198,002,169,054,055
49218 :133,001,032,000,160,169,049
49224 :055,133,001,096,072,169,086
49230 :054,133,001,104,032,028,174
49236 :162,072,169,055,133,001,164
49242 :104,096,072,169,054,133,206
49248 :001,104,032,148,161,072,102
49254 :169,055,133,001,104,096,148
49260 :169,090,141,250,255,169,158
49266 :169,141,251,255,173,002,081
49272 :221,009,003,141,002,221,205
49278 :169,252,045,000,221,141,186
49284 :000,221,169,032,013,017,072
49290 :208,141,017,208,169,072,185
49296 :141,024,208,169,000,141,059
49302 :244,173,169,011,141,134,254
49308 :002,169,000,141,243,173,116
49314 :133,212,141,236,173,169,202
49320 :015,141,033,208,169,015,237
49326 :141,032,208,032,244,160,223
49332 :032,003,164,169,210,141,131
49338 :038,003,169,002,141,039,066
49344 :003,169,226,141,036,003,002
49350 :169,002;141,037,003,032,070
49356 :099,160,096,160,000,185,136
49362 :116,160,141,227,173,032,035
49368 :042,162,200,192,129,208,125
49374 :242,096,147,013,029,029,010
49380 :029,029,029,029,029,029,146
49386 :029,029,029,029,029,029,152
49392 :029,029,029,029,029,029,158
49398 :029,029,029,029,056,048,210
49404 :032,067,079,076,085,077,156
49410 :078,083,032,070,079,082,170
49416 :032,084,072,069,032,067,108
49422 :079,077,077,079,068,079,217
49428 :082,069,032,054,052,017,070
49434 :017,157,157,157,157,157,060
49440 :157,157,157,157,157,157,206
49446 :157,157,157,157,157,157,212
49452 :157,157,157,157,157,066,127
49458 :089,032,071,082,069,071,208
49464 :071,032,080,069,069,076,197
49470 :069,017,017,157,157,157,124
49476 :157,157,157,157,157,157,242
49482 :157,157,157,157,157,157,248
49488 :065,078,068,032,075,069,211
49494 :086,073,078,032,077,065,241
49500 :082,084,073,078,160,000,057
49506 :173,033,208,041,015,170,226
49512 :173,134,002,010,010,010,187
49518 :010,141,237,173,138,013,054
49524 :237,173,032,058,169,153,170
49530 :000,208,153,000,209,153,077
49536 :000,210,200,008,032,074,140
49542 :169,040,208,216,160,231,134
49548 :032,058,169,153,000,211,251
49554 :032,074,169,136,192,255,236
49560 :208,242,096,072,169,001,172
49566 :141,244,173,104,032,042,126
49572 :162,169,000,141,244,173,029
49578 :165,198,240,252,120,032,153
49584 :180,229,201,131,208,016,117
49590 :162,009,120,134,198,189,226
49596 :230,236,157,118,002,202,109
49602 :208,247,240,228,201,013,051
49608 :208,209,160,007,032,058,106
49614 :169,177,251,077,223,173,252
49620 :145,251,032,074,169,160,019
49626 :079,132,208,032,058,169,128
49632 :177,209,201,032,208,003,030
49638 :136,208,244,200,132,200,070
49644 :160,000,132,211,132,212,059
49650 :165,202,048,060,165,202,060
49656 :133,211,197,200,144,052,161
49662 :176,094,165,153,208,014,040
49668 :165,009,133,202,173,222,140
49674 :173,133,201,133,214,076,172
49680 :190,161,032,074,169,076,206
49686 :102,241,160,007,032,058,110
49692 :169,177,251,077,223,173,074
49698 :145,251,032,074,169,076,013
49704 :062,161,152,072,138,072,185
49710 :165,208,240,230,032,058,211
49716 :169,164,211,177,209,133,091
49722 :215,032,074,169,041,063,140
49728 :006,215,036,215,016,002,042
49734 :009,128,144,004,166,212,221
49740 :208,004,112,002,009,064,219
49746 :032,074,169,230,211,032,062
49752 :132,230,196,200,208,026,056
49758 :169,000,133,208,169,013,018
49764 :166,153,224,003,240,006,124
49770 :166,154,224,003,240,003,128
49776 :032,042,162,169,013,032,050
49782 :074,169,133,215,104,170,215
49788 :104,168,165,215,201,222,175
49794 :208,002,169,255,024,096,116
49800 :072,165,154,201,003,208,171
49806 :004,104,076,042,162,076,094
49812 :213,241,072,141,227,173,191
49818 :152,072,138,072,169,000,245
49824 :141,235,173,032,070,162,205
49830 :032,068,168,032,146,168,012
49836 :104,170,104,168,104,096,150
49842 :173,227,173,032,132,230,121
49848 :208,006,169,001,141,235,176
49854 :173,096,173,227,173,201,209
49860 :032,144,003,076,097,162,198
49866 :076,194,162,201,096,176,083
49872 :023,201,064,176,003,076,239
49878 :174,162,201,128,240,082,177
49884 :056,173,227,173,233,064,122
49890 :141,227,173,076,174,162,155
49896 :201,127,144,009,240,044,229
49902 :201,160,144,060,076,149,004
49908 :162,056,173,227,173,233,244
49914 :032,141,227,173,076,174,049
49920 :162,201,192,176,012,056,031
49926 :173,227,173,233,064,141,249
49932 :227,173,076,174,162,024,080
49938 :173,227,173,105,128,141,197
49944 :227,173,173,243,173,240,229
49950 :004,206,243,173,096,173,157
49956 :241,173,208,005,169,000,064
49962 :141,242,173,096,173,243,086
49968 :173,005,212,240,035,173,118
49974 :227,173,201,032,176,041,136
49980 :201,013,240,110,201,020,077
49986 :240,004,165,212,208,013,140
49992 :173,243,173,208,008,169,022
49998 :001,141,235,173,076,078,014
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50004 :163,076,028,163,173,241,160
50010 :173,208,005,169,000,141,018
50016 :242,173,076,066,163,173,221
50022 :227,173,201,141,240,066,126
50028 :201,148,208,012,165,212,030
50034 :208,008,169,001,141,240,113
50040 :173,076,066,163,056,173,059
50046 :227,173,233,064,141,227,167
50052 :173,076,028,163,173,243,220
50058 :173,208,017,169,000,141,078
50064 :243,173,165,212,208,011,132
50070 :169,000,141,242,173,076,183
50076 :058,163,206,243,173,169,144
50082 :001,141,242,173,169,000,120
50088 :141,235,173,076,186,163,118
50094 :169,001,141,235,173,169,038
50100 :000,141,240,173,133,212,055
50106 :173,227,173,201,032,176,144
50112 :102,201,008,208,005,160,108
50118 :128,140,145,002,201,009,055
50124 :208,005,160,000,140,145,094
50130 :002,201,013,208,005,072,199
50136 :032,053,165,104,201,014,017
50142 :208,005,160,001,140,236,204
50148 :173,201,017,208,008,238,049
50154 :222,173,072,032,206,164,079
50160 :104,201,018,208,008,160,171
50166 :001,140,242,173,140,241,159
50172 :173,201,019,208,017,160,006
50178 :000,132,009,140,222,173,166
50184 :072,032,206,164,169,240,123
50190 :141,223,173,104,201,029,117
50196 :208,007,230,009,072,032,066
50202 :210,164,104,201,020,208,165
50208 :005,072,032,092,165,104,246
50214 :096,201,141,208,005,072,249
50220 :032,053,165,104,201,142,229
50226 :208,005,160,000,140,236,031
50232 :173,201,145,208,008,206,229
50238 :222,173,072,032,206,164,163
50244 :104,201,146,208,008,160,127
50250 :000,140,242,173,140,241,242
50256 :173,201,147,208,005,072,118
50262 :032,003,164,104,201,148,226
50268 :208,005,072,032,080,166,143
50274 :104,201,157,208,007,198,205
50280 :009,072,032,210,164,104,183
50286 :096,032,058,169,169,000,122
50292 :133,251,169,224,133,252,254
50298 :169,000,141,225,173,141,203
50304 :226,173,141,036,164,169,013
50310 :224,141,037,164,169,000,101
50316 :170,168,138,153,255,255,255
50322 :136,208,249,238,037,164,154
50328 :173,037,164,201,255,208,166
50334 :239,160,064,169,000,153,175
50340 :000,255,136,016,250,169,222
50346 :000,133,009,141,222,173,080
50352 :169,240,141,223,173,173,015
50358 :244,173,240,006,160,007,244
50364 :169,240,145,251,162,024,155
50370 :024,189,196,169,105,212,065
50376 :141,107,164,189,170,169,116
50382 :141,106,164,169,032,160,210
50388 :079,153,255,255,136,192,002
50394 :255,208,248,202,224,255,074
50400 :208,224,032,210,164,032,070
50406 :074,169,096,169,000,141,111
50412 :226,173,165,009,074,010,125
50418 :046,226,173,010,046,226,201
50424 :173,010,046,226,173,141,249
50430 :225,173,172,222,173,185,124
50436 :118,169,133,251,024,185,116
50442 :144,169,109,226,173,133,196
50448 :252,024,173,225,173,101,196
50454 :251,133,251,169,000,101,159
50460 :252,133,252,024,165,252,082
50466 :105,224,133,252,165,009,154
50472 :041,001,240,008,169,015,002
50478 :141,223,173,076,205,164,004
50484 :169,240,141,223,173,096,070
50490 :169,255,133,202,165,009,223
50496 :133,211,048,014,201,080,239
50502 :144,021,169,000,133,009,034
50508 :238,222,173,076,241,164,166
50514 :230,009,206,222,173,048,202
50520 :024,169,079,133,009,173,163
50526 :222,173,133,214,048,013,129
50532 :201,025,144,012,206,222,142
50538 :173,032,135,167,076,008,185
50544 :165,238,222,173,169,001,056
50550 :141,234,173,173,244,173,232
50556 :240,015,160,007,032,058,124
50562 :169,177,251,077,223,173,176
50568 :145,251,032,074,169,174,213
50574 :222,173,189,170,169,133,174
50580 :209,024,189,196,169,105,016
50586 :212,133,210,032,168,168,053
50592 :096,238,222,173,169,000,034
50598 :133,009,141,243,173,141,238
50604 :242,173,141,241,173,032,150
50610 :210,164,173,033,208,041,239
50616 :015,205,246,173,240,003,042
50622 :032,244,160,173,033,208,016
50628 :141,246,173,096,032,058,174
50634 :169,169,001,141,244,173,075
50640 :165,009,208,003,076,066,223
50646 :166,160,007,177,251,077,028
50652 :223,173,145,251,056,165,209
50658 :251,233,008,133,253,165,245
50664 :252,233,000,133,254,165,245
50670 :009,041,001,208,025,160,170
50676 :007,177,251,041,240,074,010
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50688 :177,253,041,240,013,228,184
50694 :173,145,253,136,016,233,194
50700 :172,222,173,200,024,185,220
50706 :144,169,105,224,141,238,015
50712 :173,056,185,118,169,233,190
50718 :001,141,230,173,173,238,218
50724 :173,233,000,141,231,173,219
50730 :169,008,141,229,173,160,154
50736 :004,173,230,173,141,222,223
50742 :165,173,231,173,141,223,136
50748 :165,056,169,080,229,009,000
50754 :074,105,000,170,024,008,191
50760 :040,046,255,255,008,056,220
50766 :173,222,165,233,008,141,252
50772 :222,165,173,223,165,233,241
50778 :000,141,223,165,202,208,005
50784 :231,136,240,004,040,076,055
50790 :197,165,040,206,230,173,089
50796 :208,003,206,231,173,206,111
50802 :229,173,208,185,160,007,052
50808 :177,251,077,223,173,145,142
50814 :251,174,222,173,189,170,025
50820 :169,133,253,024,189,196,072
50826 :169,105,212,133,254,056,043
50832 :169,079,229,009,170,164,196
50838 :009,177,253,136,145,253,099
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50856 :253,198,009,032,210,164,010
50862 :169,000,141,234,173,032,155
50868 :074,169,169,000,141,244,209
50874 :173,096,032,058,169,172,118
50880 :222,173,200,056,185,118,122
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50898 :024,165,254,105,224,133,091
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50916 :136,016,244,160,007,177,200
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50928 :173,173,244,173,240,008,227
50934 :173,245,173,145,251,076,029
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50964 :180,166,165,251,141,230,129
50970 :173,165,252,141,231,173,137
50976 :169,008,141,229,173,160,144
50982 :004,173,230,173,141,210,201
50988 :166,173,231,173,141,211,115
50994 :166,056,169,080,229,009,247
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51012 :166,105,008,141,210,166,096
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51024 :211,166,202,208,231,136,210
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51048 :208,187,024,165,251,105,020
51054 :008,133,253,165,252,105,002
51060 :000,133,254,165,009,041,206
51066 :001,240,031,160,007,177,226
51072 :251,041,015,010,010,010,209
51078 :010,141,228,173,177,253,092
51084 :041,015,013,228,173,145,243
51090 :253,177,251,041,240,145,229
51096 :251,136,016,227,160,007,181
51102 :177,251,077,223,173,141,176
51108 :245,173,173,244,173,240,132
51114 :005,173,245,173,145,251,138
51120 :032,210,164,032,058,169,073
51126 :174,222,173,189,170,169,255
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51138 :105,212,133,254,056,169,099
51144 :079,229,009,170,160,078,157
51150 :177,253,200,145,253,136,090
51156 :136,202,224,255,208,244,201
51162 :169,032,164,009,145,253,222
51168 :169,000,141,234,173,032,205
51174 :074,169,173,243,173,201,239
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51192 :141,158,167,024,169,224,107
51198 :105,001,141,155,167,160,215
51204 :000,185,064,255,153,000,149
51210 :255,200,208,247,238,155,033
51216 :167,238,158,167,173,155,050
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51240 :000,255,136,192,255,208,062
51246 :248,056,165,251,233,064,039
51252 :133,251,165,252,233,001,063
51258 :133,252,162,001,189,170,197
51264 :169,141,246,167,024,189,232
51270 :196,169,105,212,141,247,116
51276 :167,202,189,170,169,141,090
51282 :249,167,024,189,196,169,052
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51294 :008,160,000,185,255,255,189
51300 :153,255,255,200,208,247,138
51306 :238,247,167,238,250,167,133
51312 :202,208,238,162,024,189,111
51318 :170,169,141,029,168,024,051
51324 :189,196,169,105,212,141,112
51330 :030,168,169,032,160,079,000
51336 :153,255,255,136,192,255,102
51342 :208,248,032,074,169,169,018
51348 :127,141,000,220,173,001,042
51354 :220,201,251,008,169,127,106
51360 :141,000,220,040,208,009,010
51366 :160,000,234,202,208,252,198
51372 :136,208,249,096,169,000,006
51378 :133,254,032,058,169,173,229
51384 :227,173,041,001,240,008,106
51390 :169,015,141,224,173,076,220
51396 :095,168,169,240,141,224,209
51402 :173,173,227,173,074,010,008
51408 :038,254,010,038,254,010,044
51414 :038,254,133,253,173,236,021
51420 :173,208,014,024,169,222,006
51426 :101,253,133,253,169,169,024
51432 :101,254,076,140,168,024,227
51438 :169,222,101,253,133,253,089
51444 :169,171,101,254,133,254,046
51450 :032,074,169,096,173,235,005
51456 :173,208,016,169,000,141,195
51462 :234,173,032,168,168,032,045
51468 :044,169,230,009,032,210,194
51474 :164,096,032,125,164,032,119
51480 :058,169,160,007,174,234,058
51486 :173,240,005,169,000,076,181
51492 :191,168,177,253,045,224,070
51498 :173,174,224,173,224,240,226
51504 :208,004,074,074,074,074,044
51510 :141,228,173,173,223,173,141
51516 :201,015,240,010,173,228,159
51522 :173,010,010,010,010,141,164
51528 :228,173,169,255,174,234,025
51534 :173,208,005,173,223,173,009
51540 :073,255,049,251,013,228,185
51546 :173,192,007,208,008,174,084
51552 :244,173,240,003,077,223,032
51558 :173,174,234,173,208,023,063
51564 :174,241,173,208,005,174,059
51570 :242,173,240,013,077,223,058
51576 :173,072,173,227,173,009,179
51582 :128,141,227,173,104,145,020
51588 :251,136,016,148,173,243,075
51594 :173,005,212,240,005,169,174
51600 :000,141,242,173,032,074,038
51606 :169,096,164,009,173,227,220
51612 :173,032,058,169,145,209,174
51618 :032,074,169,096,072,120,213
51624 :173,014,220,041,254,141,243
51630 :014,220,169,052,133,001,251
51636 :104,096,072,169,054,133,040
51642 :001,173,014,220,009,001,092
51648 :141,014,220,088,104,096,087
51654 :072,152,072,138,072,169,105
51660 :169,072,169,109,072,008,035
51666 :032,074,169,120,076,071,240
51672 :254,032,058,169,104,170,235
51678 :104,168,104,064,000,064,214
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51696 :128,192,000,064,128,192,176
51702 :000,064,128,192,000,064,182
51708 :000,001,002,003,005,006,013
51714 :007,008,010,011,012,013,063
51720 :015,016,017,018,020,021,115
51726 :022,023,025,026,027,028,165
51732 :030,031,000,080,160,240,049
51738 :064,144,224,048,128,208,074
51744 :032,112,192,016,096,176,144
51750 :000,080,160,240,064,144,214
51756 :224,048,128,208,000,000,140
51762 :000,000,001,001,001,002,055
51768 :002,002,003,003,003,004,073
51774 :004,004,005,005,005,005,090
51780 :006,006,006,007,007,007,107
51786 :068,170,170,174,138,138,164
51792 :106,000,196,170,168,200,152
51798 :168,170,196,000,206,168,226
51804 :168,174,168,168,206,000,208
51810 :228,138,136,234,138,138,086
51816 :132,000,174,164,164,228,198
51822 :164,164,174,000,234,042,120
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51834 :138,142,142,138,138,138,190
51840 :234,000,206,170,170,170,054
51846 :170,170,174,000,196,170,246
51852 :170,202,138,138,132,002,154
51858 :198,168,168,196,162,162,176
51864 :172,000,234,074,074,074,012
51870 :074,074,078,000,170,170,212
51876 :170,170,174,174,074,000,158
51882 :170,170,074,068,068,164,116
51888 :164,000,230,036,068,068,230
51894 :068,132,230,000,070,162,076
51900 :130,194,130,130,230,000,234
51906 :032,114,036,047,036,034,237
51912 :032,032,004,004,004,004,024
51918 :004,000,004,000,160,170,032
51924 :014,010,014,010,000,000,004
51930 :074,226,132,228,036,232,122
51936 :074,000,066,162,164,064,242
51942 :160,160,096,016,040,068,002
51948 :130,130,130,068,040,000,222
51954 :000,160,068,238,068,160,168
51960 :000,000,000,000,000,014,006
51966 :000,096,032,064,001,001,192
51972 :002,006,004,008,072,000,096
51978 :068,172,164,164,164,164,138
51984 :078,000,078,162,036,066,180
51990 :130,138,228,000,174,168,092
51996 :238,034,034,042,038,000,158
52002 :078,162,130,196,164,168,164
52008 :072,000,068,170,170,070,078
52014 :162,164,072,000,000,000,188
52020 :068,000,000,068,004,008,200
52026 :016,032,078,128,078,032,166
52032 :016,000,132,074,034,020,084
52038 :036,064,132,000,004,004,054
52044 :014,254,010,004,014,000,116
52050 :032,032,032,047,032,032,033
52056 :032,032,000,015,240,000,151
52062 :000,000,000,000,004,004,102
52068 :004,004,004,004,244,004,108
52074 :032,032,032,044,038,034,062
52080 :034,034,034,034,054,028,074
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52092 :132,132,130,130,129,241,250
52098 :031,024,040,040,072,072,153
52104 :136,136,240,016,022,031,205
52110 :031,022,016,016,000,009,236
52116 :015,015,015,006,240,000,183
52122 :064,064,064,065,067,066,032
52128 :066,066,144,144,102,105,019
52134 :105,102,144,144,098,098,089
52140 :146,146,098,098,242,002,136
52146 :002,066,066,239,226,066,075
52152 :066,002,066,130,066,130,132
52158 :066,130,066,130,015,007,092
52164 :023,099,163,163,161,001,038
52170 :012,012,012,012,012,012,018
52176 :012,012,015,000,000,000,247
52182 :240,240,240,240,008,008,166
52188 :008,008,008,008,008,248,252
52194 :161,081,161,081,161,081,184
52200 :161,081,015,014,012,012,015
52206 :172,088,168,088,050,050,086
52212 :050,051,050,050,050,050,033
52218 :002,002,002,003,048,048,099
52224 :048,048,000,000,000,224,064
52230 :032,032,047,047,002,002,168
52236 :002,063,032,032,032,032,205
52242 :002,002,002,254,034,034,090
52248 :034,034,140,140,140,140,140
52254 :140,140,140,140,063,063,204
52260 :048,048,048,048,048,048,068
52266 :240,240,240,000,000,015,009
52272 :015,015,016,016,016,016,142
52278 :028,028,028,252,050,050,234
52284 :050,062,000,000,000,000,172
52290 :204,204,204,204,003,003,120
52296 :003,003,064,160,172,162,124
52302 :142,138,110,000,128,128,212
52308 :198,168,168,168,198,000,216
52314 :032,032,100,170,174,168,254
52320 :102,000,032,064,068,234,084
52326 :074,070,066,004,128,132,064
52332 :192,164,164,164,164,000,188
52338 :008,040,010,042,044,042,044
52344 :170,064,192,064,074,078,250
52350 :078,074,234,000,000,000,000
52356 :196,170,170,170,164,000,234
52362 :000,000,198,170,170,198,106
52368 :130,130,000,000,206,168,010
52374 :142,130,142,000,000,064,116
52380 :234,074,074,074,078,000,178
52386 :000,000,170,170,174,174,082
52392 :074,000,000,000,170,170,070
52398 :070,162,162,012,006,004,078
52404 :228,036,068,132,230,000,106
52410 :070,162,130,194,130,130,234
52416 :230,000,032,114,036,047,139
52422 :036,034,032,032,004,004,084
52428 :004,004,004,000,004,000,220
52434 :160,170,014,010,014,010,076
52440 :000,000,074,226,132,228,108
52446 :036,232,074,000,066,162,024
52452 :164,064,160,160,096,016,120
52458 :040,068,130,130,130,068,032
52464 :040,000,000,160,068,238,234
52470 :068,160,000,000,000,000,218
52476 :000,014,000,096,032,064,202
52482 :001,001,002,006,004,008,024
52488 :072,000,068,172,164,164,136
52494 :164,164,078,000,078,162,148
52500 :036,066,130,138,228,000,106
52506 :174,168,238,034,034,042,204
52512 :038,000,078,162,130,196,124
52518 :164,168,072,000,068,170,168
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52524 :170,070,162,164,072,000,170
52530 :000,000,068,000,000,068,186
52536 :004,008,016,032,078,128,066
52542 :078,032,016,000,132,074,138
52548 :034,020,036,064,132,000,098
52554 :004,010,010,254,010,010,116
52560 :010,000,196,170,168,200,056
52566 :168,170,196,000,206,168,226
52572 :168,174,168,168,206,000,208
52578 :228,138,136,234,138,138,086
52584 :132,000,174,164,164,228,198
52590 :164,164,174,000,234,042,120
52596 :042,044,042,170,074,000,232
52602 :138,142,142,138,138,138,190
52608 :234,000,206,170,170,170,054
52614 :170,170,174,000,196,170,246
52620 :170,202,138,138,132,002,154
52626 :198,168,168,196,162,162,176
52632 :172,000,234,074,074,074,012
52638 :074,074,078,000,170,170,212
52644 :170,170,174,174,074,000,158
52650 :170,170,074,068,068,164,116
52656 :164,000,226,034,066,079,233
52662 :066,130,226,002,066,130,034
52668 :066,130,066,130,066,130,008
52674 :082,169,084,162,089,164,176
52680 :082,169,012,012,012,012,243
52686 :012,012,012,012,015,000,013
52692 :000,000,240,240,240,240,148
52698 :008,008,008,008,008,008,010
52704 :008,248,161,081,161,081,196
52710 :161,081,161,081,004,009,215
52716 :002,004,169,082,164,089,234
52722 :050,050,050,051,050,050,031
52728 :050,050,002,002,002,003,101
52734 :048,048,048,048,000,000,190
52740 :000,224,032,032,047,047,130
52746 :002,002,002,063,032,032,143
52752 :032,032,002,002,002,254,084
52758 :034,034,034,034,140,140,182
52764 :140,140,140,140,140,140,100
52770 :063,063,048,048,048,048,096
52776 :048,048,240,240,240,000,088
52782 :000,015,015,015,000,032,123
52788 :032,032,172,108,044,012,196
52794 :050,050,050,062,000,000,014
52800 :000,000,204,204,204,204,112
52806 :003,003,003,003,000,013,095
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Program 2: Custom-80

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49164 :179,169,075,133,251,169,220
49170 :018,133,252,169,000,133,211
49176 :253,169,048,133,254,160,017
49182 :000,177,251,145,253,200,032
49188 :208,249,230,252,230,254,179
49194 :165,252,201,023,208,239,106
49200 :169,011,141,033,208,169,011
49206 :000,141,134,002,141,032,248
49212 :208,169,147,032,210,255,057
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49230 :172,195,141,173,195,169,099
49236 :008,032,210,255,169,005,251
49242 :141,165,195,169,013,141,146
49248 :248,007,169,007,141,039,195
49254 :208,169,001,141,021,208,082
49260 :169,000,168,153,064,003,153
49266 :200,192,064,208,248,169,171
49272 :252,141,064,003,141,091,044
49278 :003,160,003,169,132,153,234
49284 :064,003,200,200,200,192,223
49290 :026,144,246,032,073,199,090
49296 :032,159,192,032,198,194,183
49302 :032,248,194,032,049,194,131
49308 :076,144,192,162,000,160,122
49314 :000,024,032,240,255,173,118
49320 :160,195,041,001,201,001,255
49326 :240,005,169,240,076,183,063
49332 :192,169,015,141,163,195,031
49338 :173,160,195,074,010,133,163
49344 :251,169,000,133,252,006,235
49350 :251,038,252,006,251,038,010
49356 :252,169,048,024,101,252,026
49362 :133,252,173,163,195,073,175
49368 :255,141,166,195,160,000,109
49374 :169,018,032,210,255,177,059
49380 :251,045,163,195,141,162,161
49386 :195,162,000,173,163,195,098
49392 :201,015,240,012,078,162,180
49398 :195,078,162,195,078,162,092
49404 :195,078,162,195,173,162,193
49410 :195,041,008,240,005,169,148
49416 :001,076,014,193,169,000,205
49422 :032,146,193,141,134,002,150
49428 :169,207,032,210,255,173,042
49434 :162,195,041,004,240,005,161
49440 :169,001,076,039,193,169,167
49446 :000,232,032,146,193,141,014
49452 :134,002,169,207,032,210,030
49458 :255,173,162,195,041,002,110
49464 :240,005,169,001,076,065,100
49470 :193,169,000,232,032,146,066
49476 :193,141,134,002,169,207,146
49482 :032,210,255,173,162,195,077
49488 :041,001,240,005,169,001,025
49494 :076,091,193,169,000,232,079
49500 :032,146,193,141,134,002,228
49506 :169,207,032,210,255,169,116
49512 :013,032,210,255,173,163,182
49518 :195,201,015,240,012,014,019
49524 :162,195,014,162,195,014,090
49530 :162,195,014,162,195,177,003
49536 :251,045,166,195,013,162,192
49542 :195,145,251,200,192,008,101
49548 :240,003,076,222,192,096,201
49554 :141,164,195,140,169,195,126
49560 :173,170,195,240,008,169,083
49566 :000,141,164,195,141,162,193
49572 :195,173,172,195,240,006,121
49578 :173,162,195,153,178,002,009
49584 :173,173,195,240,006,185,124
49590 :178,002,141,162,195,204,040
49596 :061,003,208,106,236,060,094
49602 :003,208,101,238,062,003,041
49608 :173,000,220,041,016,208,090
49614 :067,205,063,003,240,065,081
49620 :141,063,003,169,004,056,136
49626 :237,060,003,168,169,001,088
49632 :136,240,004,010,076,224,146
49638 :193,141,168,195,073,255,231
49644 :141,167,195,173,162,195,245
49650 :045,168,195,208,015,173,022
49656 :162,195,045,167,195,013,001
49662 :168,195,141,162,195,076,167
49668 :021,194,173,162,195,045,026
49674 :167,195,141,162,195,076,178
49680 :021,194,141,063,003,173,099
49686 :062,003,201,050,144,014,240
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49692 :201,100,144,005,169,000,135
49698 :141,062,003,169,014,141,052
49704 :164,195,173,164,195,172,079
49710 :169,195,096,206,165,195,048
49716 :208,065,173,000,220,041,247
49722 :015,141,162,195,041,001,101
49728 :208,003,206,061,003,173,206
49734 :162,195,041,002,208,003,169
49740 :238,061,003,173,162,195,140
49746 :041,004,208,003,206,060,092
49752 :003,173,162,195,041,008,158
49758 :208,003,238,060,003,173,011
49764 :162,195,201,015,240,008,153
49770 :169,051,141,062,003,032,052
49776 :120,194,169,005,141,165,138
49782 :195,096,173,060,003,201,078
49788 :255,208,008,169,003,141,140
49794 :060,003,206,160,195,173,159
49800 :060,003,201,004,208,008,108
49806 :169,000,141,060,003,238,241
49812 :160,195,173,061,003,201,173
49818 :255,208,014,169,007,141,180
49824 :061,003,173,160,195,056,040
49830 :233,064,141,160,195,173,108
49836 :061,003,201,008,208,014,155
49842 :169,000,141,061,003,173,213
49848 :160,195,024,105,064,141,105
49854 :160,195,169,016,141,063,166
49860 :003,096,173,160,195,074,129
49866 :074,074,074,074,074,141,201
49872 :053,003,173,160,195,041,065
49878 :063,141,052,003,173,053,187
49884 :003,010,010,010,024,105,126
49890 :153,141,001,208,173,052,186
49896 :003,010,010,024,105,055,183
49902 :141,000,208,169,000,042,030
49908 :141,016,208,096,169,000,106
49914 :141,170,195,141,171,195,239
49920 :141,172,195,141,173,195,249
49926 :032,228,255,208,001,096,058
49932 :201,147,208,006,169,001,232
49938 :141,170,195,096,201,019,072
49944 :208,006,169,000,141,160,196
49950 :195,096,201,157,208,008,127
49956 :169,255,141,060,003,076,228
49962 :120,194,201,029,208,008,034
49968 :169,004,141,060,003,076,245
49974 :120,194,201,145,208,008,162
49980 :169,255,141,061,003,076,253
49986 :120,194,201,017,208,008,046
49992 :169,008,141,061,003,076,018
49998 :120,194,201,088,208,003,124
50004 :076,124,195,201,133,208,253
50010 :006,169,001,141,172,195,006
50016 :096,201,136,208,006,169,144
50022 :001,141,173,195,096,201,141
50028 :083,208,004,032,125,197,245
50034 :096,201,076,208,004,032,219
50040 :046,197,096,096,169,075,031
50046 :133,251,169,018,133,252,058
50052 :169,000,133,253,169,048,136
50058 :133,254,160,000,177,253,091
50064 :145,251,200,208,249,230,147
50070 :252,230,254,165,252,201,224
50076 :023,208,239,000,000,000,114
50082 :000,000,000,000,000,000,162
50088 :000,000,000,000,000,000,168
50094 :158,029,029,029,029,029,221
50100 :029,029,029,029,029,029,098
50106 :029,029,029,029,029,067,142
50112 :085,083,084,079,077,045,133
50118 :056,048,013,144,029,029,005
50124 :029,029,029,029,067,076,207
50130 :082,032,045,032,067,076,032
50136 :069,065,082,032,067,085,104
50142 :082,082,069,078,084,032,137
50148 :067,072,065,082,065,067,134
50154 :084,069,082,013,029,029,028
50160 :029,029,029,029,072,079,251
50166 :077,069,032,045,032,071,060
50172 :079,032,084,079,032,070,116
50178 :073,082,083,084,032,067,167
50184 :072,065,082,065,067,084,187
50190 :069,082,013,029,029,029,009
50196 :029,029,029,067,085,082,085
50202 :083,079,082,032,075,069,190
50208 :089,083,032,077,079,086,222
50214 :069,032,065,082,079,085,194
50220 :078,068,032,067,072,065,170
50226 :082,032,083,069,084,013,157
50232 :029,029,029,029,029,029,230
50238 :070,049,032,045,032,083,117
50244 :084,079,082,069,032,067,225
50250 :072,065,082,065,067,084,253
50256 :069,082,032,073,078,032,190
50262 :066,085,070,070,069,082,016
50268 :013,029,029,029,029,029,250
50274 :029,070,055,032,045,032,105
50280 :071,069,084,032,067,072,243
50286 :065,082,065,067,084,069,030
50292 :082,032,070,082,079,077,026
50298 :032,066,085,070,070,069,002
50304 :082,013,029,029,029,029,083
50310 :029,029,088,032,045,032,133
50316 :080,085,084,032,082,069,060
50322 :068,069,070,073,078,069,061
50328 :068,032,067,072,065,082,026
50334 :065,067,084,069,082,083,096
50340 :032,073,078,013,029,029,162
50346 :029,029,029,029,032,032,094
50352 :083,067,082,069,069,078,112
50358 :032,056,048,013,029,029,133
50364 :029,029,029,029,074,079,201
50370 :089,083,084,073,067,075,153
50376 :032,067,079,078,084,082,110
50382 :079,076,083,032,067,085,116
50388 :082,083,079,082,032,077,135
50394 :079,086,069,077,069,078,164
50400 :084,013,029,029,029,029,181
50406 :029,029,032,032,065,082,243
50412 :079,085,078,068,032,069,135
50418 :088,080,065,078,068,069,178
50424 :068,032,067,072,065,082,122
50430 :065,067,084,069,082,032,141
50436 :065,078,068,013,029,029,030
50442 :029,029,029,029,032,032,190
50448 :066,085,084,084,079,078,236
50454 :032,083,069,084,083,032,149
50460 :065,078,068,032,082,069,166
50466 :083,069,084,083,032,080,209
50472 :073,088,069,076,083,000,173
50478 :032,224,197,008,173,215,127
50484 :198,208,002,040,096,040,124
50490 :176,031,169,008,170,160,004
50496 :000,032,186,255,173,215,157
50502 :198,162,199,160,198,032,251
50508 :189,255,169,000,162,000,083
50514 :160,048,032,213,255,032,054
50520 :234,198,096,032,203,199,026
50526 :169,008,162,001,160,000,082
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50532 :032,186,255,173,215,198,135
50538 :162,199,160,198,032,189,022
50544 :255,169,000,170,160,048,146
50550 :032,213,255,032,236,199,061
50556 :096,032,224,197,008,173,086
50562 :215,198,208,002,040,096,121
50568 :040,176,042,032,045,199,158
50574 :169,008,170,160,255,032,168
50580 :186,255,173,215,198,162,057
50586 :199,160,198,032,189,255,163
50592 :169,048,133,252,169,000,163
50598 :133,251,169,251,162,000,108
50604 :160,056,032,216,255,032,155
50610 :234,198,096,032,203,199,116
50616 :169,008,162,001,160,000,172
50622 :032,186,255,173,215,198,225
50628 :162,199,160,198,032,189,112
50634 :255,169,048,133,252,169,204
50640 :000,133,251,169,251,162,150
50646 :000,160,056,032,216,255,165
50652 :032,236,199,096,160,000,175
50658 :162,011,024,032,240,255,182
50664 :169,032,162,040,032,210,109
50670 :255,202,208,250,160,000,033
50676 :162,011,024,032,240,255,200
50682 :162,000,189,192,198,032,255
50688 :210,255,232,224,007,208,112
50694 :245,162,000,169,164,032,010
50700 :210,255,138,072,032,228,179
50706 :255,168,104,170,152,201,044
50712 :000,240,243,201,020,240,200
50718 :042,201,034,240,235,201,215
50724 :013,240,065,201,032,144,219
50730 :227,201,128,176,223,224,197
50736 :016,240,219,157,199,198,053
50742 :232,072,169,157,032,210,158
50748 :255,104,032,210,255,169,061
50754 :164,032,210,255,076,014,049
50760 :198,224,000,240,193,169,072
50766 :157,032,210,255,169,032,165
50772 :032,210,255,169,157,032,171
50778 :210,255,032,210,255,202,230
50784 :169,164,032,210,255,076,234
50790 :014,198,142,215,198,160,005
50796 :000,162,011,024,032,240,065
50802 :255,162,017,169,032,032,013
50808 :210,255,202,208,250,174,139
50814 :215,198,208,001,096,160,236
50820 :000,162,011,024,032,240,089
50826 :255,162,000,189,216,198,134
50832 :032,210,255,232,224,018,091
50838 :208,245,032,228,255,240,078
50844 :251,201,068,240,009,201,102
50850 :084,208,243,056,008,076,069
50856 :172,198,024,008,160,000,218
50862 :162,011,024,032,240,255,130
50868 :162,017,169,032,032,210,034
50874 :255,202,208,250,040,096,213
50880 :159,078,065,077,069,058,186
50886 :155,000,000,000,000,000,097
50892 :000,000,000,000,000,000,204
50898 :000,000,000,000,000,000,210
50904 :153,018,084,146,065,080,250
50910 :069,032,079,082,032,018,022
50916 :068,146,073,083,075,063,224
50922 :032,183,255,041,191,208,120
50928 :001,096,162,011,160,000,158
50934 :024,032,240,255,169,018,216
50940 :032,210,255,169,150,032,076
50946 :210,255,169,000,032,189,089
50952 :255,169,015,162,008,160,009
50958 :015,032,186,255,032,192,214
50964 :255,162,015,032,198,255,169
50970 :032,207,255,032,210,255,249
50976 :201,013,208,246,169,015,116
50982 :032,195,255,032,204,255,243
50988 :096,169,002,160,199,162,064
50994 :071,032,189,255,169,015,013
51000 :168,162,008,032,186,255,099
51006 :032,192,255,169,015,032,245
51012 :195,255,096,073,048,120,087
51018 :169,127,141,013,220,169,145
51024 :001,141,026,208,173,060,177
51030 :003,141,018,208,169,027,140
51036 :141,017,208,169,199,141,199
51042 :021,003,169,250,141,020,190
51048 :003,088,169,147,032,210,241
51054 :255,160,000,169,195,133,254
51060 :252,169,174,133,251,177,248
51066 :251,240,011,032,210,255,097
51072 :200,208,246,230,252,076,060
51078 :121,199,169,008,133,251,247
51084 :169,006,133,252,165,251,092
51090 :133,253,165,252,024,105,054
51096 :212,133,254,162,000,160,049
51102 :004,138,145,251,169,000,097
51108 :145,253,232,200,192,036,198
51114 :208,243,165,251,024,105,142
51120 :040,133,251,165,252,105,098
51126 :000,133,252,165,253,024,241
51132 :105,040,133,253,165,254,114
51138 :105,000,133,254,224,128,014
51144 :208,211,096,120,169,000,236
51150 :141,026,208,169,255,141,122
51156 :013,220,169,049,141,020,056
51162 :003,169,234,141,021,003,021
51168 :169,000,141,021,208,088,083
51174 :169,147,032,210,255,096,115
51180 :032,073,199,169,001,141,083
51186 :021,208,169,004,141,136,153
51192 :002,096,173,018,208,201,178
51198 :146,208,021,169,000,141,171
51204 :018,208,169,028,141,024,080
51210 :208,169,001,141,025,208,250
51216 :104,168,104,170,104,064,218
51222 :169,146,141,018,208,169,105
51228 :021,141,024,208,169,001,080
51234 :141,025,208,076,049,234,255
51240 :000,000,000,000,000,000,040
```

Program 3: Custom Character Loader

```
10 INPUT"FILENAME:";N$,D              :rem 205
20 F$=N$:ZK=PEEK(53)+256*PEEK(54)-LEN(F$)
   :POKE 782,ZK/256                   :rem 180
25 POKE781,ZK-PEEK(782)*256:POKE780,LEN(F
   $):SYS65469                        :rem 39
30 POKE780,1:POKE781,D:POKE782,0:SYS65466
                                      :rem 177
40 POKE780,0:POKE781,222:POKE782,169:SYS6
   5493                               :rem 115
50 CLOSE1:PRINT:PRINT"{CLR}"CHR$(142)
                                      :rem 90
```

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Treasure Hunt

(Article on page 110.)

Program 1: Treasure Hunt—

VIC Version

Memory expansion required.

```
20 IFPEEK(44)<32THENPOKE56,28:POKE52,28
                                    :rem 53
25 PRINT"{RVS}{CLR}{7 DOWN}{YEL}****TREAS
   URE{2 SPACES}HUNT****"           :rem 236
26 PRINT"{3 DOWN}{PUR}{RIGHT}DEFINING
   {2 SPACES}CHARACTERS"            :rem 73
30 FORI=7168TO7679:POKEI,PEEK(25600+I):NE
   XT                               :rem 100
35 FORX=832TO936:READA:POKEX,A:NEXT:rem 4
40 FORI=7168+35*8TO7168+47*8+7:READA:POKE
   I,A:NEXT                         :rem 158
41 FORI=7168+58*8TO7168+61*8+7:READA:POKE
   I,A:NEXT                         :rem 160
45 GOSUB800                         :rem 129
49 GOSUB200                         :rem 127
50 SH=36876:SL=36875:V=36878:POKE36869,PE
   EK(36869)AND240OR15:RN=RN+1:P=1:Q=22
                                    :rem 29
55 GOSUB510:GOSUB1000:GOSUB1300     :rem 121
60 CL=8118                           :rem 4
65 SYS832                            :rem 7
70 TL=CL:Z=CL:ONPEEK(830)GOSUB91,92,93,94
   ,95,96,97,98                     :rem 59
75 CL=Z:POKESL,220:POKEV,5:GOSUB300
                                    :rem 199
76 IFFLANDNOTDFTHENGOSUB650          :rem 38
77 POKESH,.:POKESL,.:POKEV,.:IFDFTHEN1600
                                    :rem 86
79 POKETL,32:POKETL+Q,32            :rem 230
80 POKECL,46:POKECL+Q,47:POKECM+CL,3:POKE
   CM+Q+CL,3:GOSUB540:IFGC<2ANDGB<2THEN50
                                    :rem 217
85 GOSUB600:IFDFTHEN1600            :rem 204
90 GOTO65                            :rem 13
91 Z=Z-Q:RETURN                     :rem 243
92 Z=Z-21:RETURN                      :rem 6
93 Z=Z+P:RETURN                     :rem 242
94 Z=Z+23:RETURN                      :rem 8
95 Z=Z+Q:RETURN                     :rem 245
96 Z=Z+21:RETURN                      :rem 8
97 Z=Z-P:RETURN                     :rem 248
98 Z=Z-23:RETURN                     :rem 14
200 PRINT"{DOWN}{RVS}{CYN}ENTER SKILL LEV
    EL 1-5"                         :rem 45
210 GETA$:IFA$=""THEN210            :rem 73
220 AA=VAL(A$):IFAA<1ORAA>5THENPRINT"
    {2 UP}";:GOTO200                :rem 156
230 RETURN                          :rem 117
300 REM COLLISION CHK               :rem 249
302 TC=0:IFPEEK(CL)=35ORPEEK(CL+Q)=35ORPE
    EK(CL)=36ORPEEK(CL+Q)=36THENTC=P
                                    :rem 58
303 IFPEEK(CL)=37ORPEEK(CL+Q)=37ORPEEK(CL
    )=38ORPEEK(CL+Q)=38THENTC=P     :rem 5
304 IFPEEK(CL)=39ORPEEK(CL+Q)=39ORPEEK(CL
    )=40ORPEEK(CL+Q)=40THENTC=P     :rem 252
305 IFPEEK(CL)=41ORPEEK(CL+Q)=41THENTC=P
                                    :rem 229
306 IFTCTHENCL=TL:RETURN            :rem 116
308 IF(PEEK(CL)=47ANDPEEK(CL+Q)=32)OR(PEE
    K(CL)=32ANDPEEK(CL+Q)=46)THENRETURN
                                    :rem 193
309 IFPEEK(CL)=32ANDPEEK(CL+Q)=32THENRETU
    RN                              :rem 215
310 IFPEEK(CL)=46ANDPEEK(CL+Q)=47THENRETU
    RN                              :rem 218
312 IFPEEK(CL)=42ORPEEK(CL+Q)=42THEN400
                                    :rem 85
315 IFPEEK(CL)=61ORPEEK(CL+Q)=61THENGB=GB
    -P:SC=SC+10*AA:POKESL,.:POKESH,180:PO
    KEV,15                          :rem 233
320 IFPEEK(CL)=60ORPEEK(CL+Q)=60THENGC=GC
    -P:SC=SC+AA:POKESL,.:POKESH,240:POKEV
    ,15                             :rem 87
323 IFPEEK(CL)=43ORPEEK(CL+Q)=43ORPEEK(CL
    )=44ORPEEK(CL+Q)=44THEN450      :rem 112
325 IFPEEK(CL)=45ORPEEK(CL+Q)=45THEN650
                                    :rem 102
330 RETURN                          :rem 118
400 REMDEAD FROM SKUL               :rem 249
405 POKETL,32:POKETL+Q,32:POKECL,46:POKEC
    L+Q,47:POKECL+CM,0:POKECL+CM+Q,0:GOTO
    700                             :rem 76
450 REM AT BOG                      :rem 234
452 D=INT(RND(1)*10)+1              :rem 165
455 IFPEEK(831)<>0ANDPEEK(CJ)=59ANDD>2THE
    NCL=CH:POKECI,32:SC=SC+100*AA:FG=P:RE
    TURN                            :rem 118
460 IFPEEK(831)<>0ANDPEEK(CJ)<>59ANDD>2TH
    ENCL=CL+47:GOTO300              :rem 80
465 CL=CH+23:POKETL,32:POKETL+Q,32:POKECL
    ,46:POKECM+CL,3:GOTO700         :rem 224
500 REM BORDER                       :rem 55
510 PRINT"{CLR}":CM=30720           :rem 253
520 FORI=7680TO7701:POKEI,35:POKECM+I,3:N
    EXT                             :rem 214
525 FORI=7723TO8185STEP22:POKEI,35:POKECM
    +I,3:NEXT                       :rem 128
530 FORI=8162TO8142STEP-1:POKEI,35:POKECM
    +I,3:NEXT                       :rem 109
535 FORI=8164TO7702STEP-22:POKEI,35:POKEC
    M+I,3:NEXT                      :rem 168
536 RETURN                          :rem 126
539 REM SCOR+TRES CHST               :rem 87
540 PRINT"{HOME}{22 DOWN}{RIGHT}{CYN}ROUN
    D"RN"SCORE"SC;:IFFGTHEN555      :rem 140
550 ON(INT(RND(1)*15))GOSUB555,555,555,55
    5,555,555,561,555,555,555,555,555,563
    ,555,555                        :rem 239
555 RETURN                          :rem 127
561 IFPEEK(CI)=32ANDPEEK(CJ)=32THENPOKECI
    ,58:POKECJ,59:POKECI+CM,6:POKECJ+CM,6
                                    :rem 127
562 RETURN                          :rem 125
563 IFPEEK(CI)=58THENPOKECI,32:POKECJ,32
                                    :rem 219
564 RETURN                          :rem 127
600 REMMOVESKULLS                   :rem 143
605 D=INT(RND(1)*AA)+1:ONDGOSUB641,642,64
    3,644,645                       :rem 34
608 TS=SK:Z=SK:POKESK,32            :rem 39
610 ONINT(RND(1)*8)+1GOSUB91,92,93,94,95,
    96,97,98                        :rem 180
615 SK=Z:IFPEEK(SK)=32THENONDGOSUB1381,13
    82,1383,1384,1385:GOTO625       :rem 171
620 IFPEEK(SK)=46ORPEEK(SK)=47THEN400
                                     :rem 2
622 SK=TS                           :rem 28
625 POKESK,42:POKESK+CM,7:RETURN    :rem 59
641 SK=S1:RETURN                    :rem 20
642 SK=S2:RETURN                    :rem 22
643 SK=S3:RETURN                    :rem 24
644 SK=S4:RETURN                    :rem 26
```

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645 SK=S5:RETURN                          :rem 28
650 REMSTAGGER                            :rem 140
655 POKETL,32:POKETL+Q,32:POKECL,46:POKEC
    L+Q,47:POKECL+CM,4:POKECL+CM+Q,4
                                          :rem 81
660 POKEV,5:POKESH,0:FORX=1TO3:POKESL,200
    :FORL=1TO10:NEXT:POKESL,244:FORL=1TO2
    5:NEXT                                :rem 233
662 POKESL,0:FORL=1TO200:NEXT:NEXT
                                          :rem 202
665 TL=CL:Z=CL:ONINT(RND(1)*8)+1GOSUB91,9
    2,93,94,95,96,97,98                   :rem 196
670 CL=Z:IFFL=.THENFL=P:GOTO300           :rem 221
680 IFFL=PTHENFL=.:GOTO300                :rem 126
700 REMDEADSOUND                          :rem 18
710 POKEV,5:POKESH,0:FORN=1TO5:POKESL,255
    :FORX=1TO200:NEXT:POKESL,180:FORX=1TO
    100:NEXT                              :rem 89
720 POKESL,0:FORX=1TO200:NEXT:NEXT:DF=1:R
    ETURN                                 :rem 29
800 PRINT"{CLR}{RVS}{CYN}YOU ARE HUNTING
    {SPACE}LOST{2 SPACES}PIRATE TREASURE
    {SPACE}ON{4 SPACES}A SECLUDED ISLAND.
    {4 SPACES}";                          :rem 92
820 PRINT"{RVS}{BLU}GUIDE THE TREASURE
    {4 SPACES}HUNTER WITH A JOYSTICKAND C
    OLLECT THE GOLD{2 SPACES}";           :rem 52
830 PRINT"{RVS}{BLU}COINS, GOLD BARS AND
    {2 SPACES}A TREASURE CHEST. THE TREAS
    URE CHEST IS{5 SPACES}";              :rem 81
832 PRINT"{RVS}SURROUNDED BY A BOG.
    {2 SPACES}";                          :rem 168
835 PRINT"YOU HAVE A 70% CHANCE OF CROSSI
    NG BY PRESS- ING THE FIRE BUTTON AS";
                                          :rem 227
838 PRINT"YOU APPROACH.{9 SPACES}";
                                          :rem 40
839 PRINT"{RVS}{PUR}THE TREASURE HAS A
    {4 SPACES}DEATH CURSE ON IT AND IS GU
    ARDED BY THE EVILSPIRITS";            :rem 46
840 PRINT" OF ANCIENT{4 SPACES}PIRATES WH
    O MAKE THE{2 SPACES}TREASURE CHEST
    {8 SPACES}DISAPPEAR AND";             :rem 146
841 PRINT" REAPPEAR FROM TIME TO TIME.
    {3 SPACES}";                          :rem 92
843 PRINT"{RVS}{GRN}PRESS ANY KEY";
                                          :rem 57
844 GETA$:IFA$=""THEN844                  :rem 99
855 PRINT"{CLR}{BLU}THE EVIL SPIRITS ALSO
     HAVE PLACED KEGS OF{3 SPACES}RUM ARO
    UND THE ISLAND ";                     :rem 179
856 PRINT"TO DISTRACT TREASURE{2 SPACES}H
    UNTERS.{14 SPACES}";                  :rem 114
857 PRINT"{PUR}IF THE TREASURE HUNTERDRIN
    KS RUM, HE WILL{3 SPACES}STAGGER AND
    {SPACE}YOU CAN'T GUIDE ";             :rem 69
858 PRINT"HIM.{12 SPACES}";               :rem 189
860 PRINT"{RVS}{RED}YOU EARN POINTS AS
    {4 SPACES}SHOWN:{16 SPACES}";         :rem 53
865 PRINT"{DOWN}COIN=1 X SKILL LEVEL
    {2 SPACES}{DOWN}BAR=10 X SKILL LEVEL
    {2 SPACES}{DOWN}TREASURE CHEST=
    {7 SPACES}";                          :rem 169
870 PRINT"{5 SPACES}100 X SKILL LEVEL";
                                          :rem 139
880 RETURN                                :rem 128
999 REMBUILD PALMGROVE                    :rem 172
1000 TB=INT(RND(1)*8)+2:PRINT"{HOME}":I=I
     NT(RND(1)*3)+1:FORX=0TOI:PRINT"
     {DOWN}":NEXT                         :rem 149
1005 PRINTTAB(TB)"{GRN}&%'&%'"            :rem 87
1006 PRINTTAB(TB)"($&%')&%'"              :rem 175
1010 PRINTTAB(TB)"{RIGHT}$($&%'$)"
                                          :rem 157
1015 PRINTTAB(TB)"{3 RIGHT}$($)$":rem 106
1020 PRINTTAB(TB)"{3 RIGHT}$ $ $" :rem 21
1023 PRINTTAB(TB)"{5 RIGHT}${BLK}
     {2 SPACES},+"                        :rem 241
1025 PRINTTAB(TB)"{GRN}{5 RIGHT}${BLU}:;
     {SPACE}{BLK},"                       :rem 122
1027 PRINTTAB(TB)"{8 RIGHT},+"            :rem 152
1028 PRINTTAB(TB)"{5 RIGHT}+,+," :rem 153
1030 CH=PEEK(209)+256*PEEK(210)-(88-(TB+7
     )):CJ=CH+Q:CI=CJ-P                   :rem 20
1035 RETURN                               :rem 169
1300 REM BUILD SCREEN                     :rem 216
1301 FORI=PTO7*AA                          :rem 8
1302 X=INT(RND(1)*396)+7702               :rem 196
1305 IFPEEK(X)<>32ORPEEK(X+P)<>32ORPEEK(X
     -P)<>32ORPEEK(X+Q)<>32ORPEEK(X-Q)<>3
     2THEN1302                            :rem 36
1310 POKEX,45:POKECM+X,4:NEXT             :rem 54
1320 FORI=PTO6*AA                          :rem 8
1325 X=INT(RND(1)*396)+7702               :rem 201
1330 IFPEEK(X)<>32ORPEEK(X+P)<>32ORPEEK(X
     -P)<>32ORPEEK(X+Q)<>32ORPEEK(X-Q)<>3
     2THEN1325                            :rem 39
1335 POKEX,42:POKECM+X,0:NEXT             :rem 54
1360 FORI=PTOAA                           :rem 172
1365 SK=INT(RND(1)*396)+7702:IFPEEK(SK)<>
     42THEN1365                           :rem 206
1370 POKESK+CM,7                          :rem 182
1375 ONIGOSUB1381,1382,1383,1384,1385
                                          :rem 241
1380 NEXT:GOTO1400                         :rem 67
1381 S1=SK:RETURN                          :rem 70
1382 S2=SK:RETURN                          :rem 72
1383 S3=SK:RETURN                          :rem 74
1384 S4=SK:RETURN                          :rem 76
1385 S5=SK:RETURN                          :rem 78
1400 GC=25:B=60:FORI=1TO25                :rem 244
1410 GOSUB1450                             :rem 16
1415 IFPEEK(X)<>32ORPEEK(X+Q)><32ORPEEK(X
     -Q)><32THEN1410                      :rem 146
1420 POKEX,B:POKECM+X,7:NEXT               :rem 20
1430 GB=5:B=61:FORI=1TO5                  :rem 147
1435 GOSUB1450                             :rem 23
1437 IFPEEK(X)<>32ORPEEK(X+Q)><32ORPEEK(X
     -Q)><32THEN1435                      :rem 157
1440 POKEX,B:POKECM+X,7:NEXT               :rem 22
1445 RETURN                               :rem 174
1450 X=INT(RND(1)*415)+7702:RETURN
                                          :rem 218
1600 REMGAMEOVER                           :rem 1
1605 POKESH,0:POKESL,0:POKE36869,PEEK(368
     69)AND240OR0                         :rem 187
1610 PRINT"{CLR}{3 DOWN}{RVS}{YEL}ANOTHER
      VICTIM OF THE PIRATE'S CURSE!!!"
                                          :rem 134
1611 PRINT"{DOWN}{RVS}{RED}SKILL LEVEL:"A
     A                                    :rem 140
1612 PRINT"{DOWN}{RVS}{RED}ROUNDS:"RN
                                          :rem 143
1613 PRINT:PRINT"{RVS}{RED}SCORE:"SC
                                          :rem 221
1615 PRINT:PRINT"{RVS}{RED}PLAY AGAIN?"
                                          :rem 104
1620 GETA$:IFA$=""THEN1620                :rem 181
1625 IFA$="Y"THENRN=0:FL=0:FG=0:DF=0:SC=0
     :PRINT"{CLR}":GOTO49                 :rem 49
1630 END                                  :rem 161
6035 DATA120,8,72,152,72,138,72,173,19,14
```

```
     5,72,173,34,145,72,169,0,141,62,3,14
     1,63,3,169                        :rem 246
6040 DATA127,141,34,145,173,32,145,73,255
     ,41,128,42,8,169,195,141,19,145,173,
     17,145,73                         :rem 207
6045 DATA255,41,60,74,74,40,42,168,41,16,
     201,16,208,3,141,63,3,152,41,15,162,
     0,232,224                         :rem 163
6050 DATA9,240,8,221,160,3,208,246,142,62
     ,3,104,141,34,145,104,141,19,145,104
     ,170,104                          :rem 108
6055 DATA168,104,40,88,96,2,3,1,5,4,12,8,
     10                                :rem 108
6060 DATA255,255,255,255,255,255,255,255,
     28,28,28,28,28,28,28,28           :rem 170
6065 DATA129,227,247,255,255,255,255,156,
     15,127,127,227,143,63,113,243
                                       :rem 195
6070 DATA248,254,254,227,249,252,207,227,
     199,159,62,56,120,96,96,64,121,120
                                       :rem 197
6075 DATA28,14,6,6,7,60,126,90,126,126,36
     ,60,24,28,63,31,255,255,127,124,56
                                       :rem 168
6080 DATA60,254,255,255,243,120,56,60,28,
     62,62,62,62,62,28                 :rem 246
6085 DATA60,126,219,255,102,60,24,255,189
     ,189,189,189,36,36,36,102          :rem 9
6087 DATA15,31,63,63,63,63,63,63,248,252,
     254,254,254,254,254,254           :rem 156
6090 DATA,,,24,24,,,,,,,127,127,,,0
                                       :rem 173
```

Program 2:

Treasure Hunt—64 Version

```
10 POKE53280,6:POKE53281,1             :rem 189
21 POKE56,48:POKE52,48:CLR              :rem 24
25 PRINT"{CLR}{7 DOWN}{13}*************
   {RVS}TREASURE HUNT{OFF}**************"
                                       :rem 127
26 PRINT"{7 DOWN}{BLU}{9 SPACES}REDEFININ
   G CHARACTERS"                       :rem 138
28 POKE56334,PEEK(56334)AND254:POKE1,PEEK
   (1)AND251                           :rem 139
30 FORI=0TO511:POKEI+12288,PEEK(53248+I):
   NEXT                                :rem 177
32 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)
   OR1                                 :rem 84
40 FORI=12288+35*8TO12288+47*8+7:READA:PO
   KEI,A:NEXT                          :rem 252
41 FORI=12288+58*8TO12288+61*8+7:READA:PO
   KEI,A:NEXT                          :rem 254
45 POKE53272,21:GOSUB800:SN=54272:POKESN+
   24,15:POKESN+5,17:POKESN+6,240:rem 240
49 POKESN,100:GOSUB200                 :rem 70
50 POKE53272,(PEEK(53272)AND240)OR12:RN=R
   N+1:P=1:Q=40                        :rem 49
55 GOSUB510:GOSUB1000:GOSUB1300        :rem 121
60 CL=1902                             :rem 254
65 JS=PEEK(56320)AND15                 :rem 244
70 TL=CL:Z=CL:ONJS-4GOSUB94,92,93,99,96,9
   8,97,99,95,91,99                     :rem 2
75 CL=Z:POKESN+1,50:POKESN+4,33:GOSUB300
                                       :rem 209
76 IFFLANDNOTDFTHENGOSUB650             :rem 38
77 POKESN+4,32:IFDFTHEN1600            :rem 119
79 POKETL,32:POKETL+Q,32               :rem 230
80 POKECL,46:POKECL+Q,47:POKECM+CL,3:POKE
   CM+Q+CL,3:GOSUB540:IFGC<2ANDGB<2THEN50
                                       :rem 217
85 GOSUB600:IFDFTHEN1600               :rem 204
90 GOTO65                               :rem 13
91 Z=Z-Q:RETURN                        :rem 243
92 Z=Z-39:RETURN                        :rem 15
93 Z=Z+P:RETURN                        :rem 242
94 Z=Z+41:RETURN                         :rem 8
95 Z=Z+Q:RETURN                        :rem 245
96 Z=Z+39:RETURN                        :rem 17
97 Z=Z-P:RETURN                        :rem 248
98 Z=Z-41:RETURN                        :rem 14
99 RETURN                               :rem 82
200 PRINT"{DOWN}{RVS}{5}ENTER SKILL LEV
    EL 1-5"                            :rem 38
210 GETA$:IFA$=""THEN210               :rem 73
220 AA=VAL(A$):IFAA<1ORAA>5THEN210
                                       :rem 252
230 RETURN                             :rem 117
300 REM COLLISION CHK                  :rem 249
302 TC=0:IFPEEK(CL)=35ORPEEK(CL+Q)=35ORPE
    EK(CL)=36ORPEEK(CL+Q)=36THENTC=P
                                       :rem 58
303 IFPEEK(CL)=37ORPEEK(CL+Q)=37ORPEEK(CL
    )=38ORPEEK(CL+Q)=38THENTC=P         :rem 5
304 IFPEEK(CL)=39ORPEEK(CL+Q)=39ORPEEK(CL
    )=40ORPEEK(CL+Q)=40THENTC=P       :rem 252
305 IFPEEK(CL)=41ORPEEK(CL+Q)=41THENTC=P
                                       :rem 229
306 IFTCTHENCL=TL:RETURN               :rem 116
308 IF(PEEK(CL)=47ANDPEEK(CL+Q)=32)OR(PEE
    K(CL)=32ANDPEEK(CL+Q)=46)THENRETURN
                                       :rem 193
309 IFPEEK(CL)=32ANDPEEK(CL+Q)=32THENRETU
    RN                                 :rem 215
310 IFPEEK(CL)=46ANDPEEK(CL+Q)=47THENRETU
    RN                                 :rem 218
312 IFPEEK(CL)=42ORPEEK(CL+Q)=42THEN400
                                       :rem 85
315 IFPEEK(CL)=61ORPEEK(CL+Q)=61THENGB=GB
    -P:SC=SC+10*AA:POKESN+1,30:POKESN+4,3
    3                                  :rem 93
320 IFPEEK(CL)=60ORPEEK(CL+Q)=60THENGC=GC
    -P:SC=SC+AA:POKESN+1,80:POKESN+4,33
                                       :rem 211
323 IFPEEK(CL)=43ORPEEK(CL+Q)=43ORPEEK(CL
    )=44ORPEEK(CL+Q)=44THEN450         :rem 112
325 IFPEEK(CL)=45ORPEEK(CL+Q)=45THEN650
                                       :rem 102
330 RETURN                             :rem 118
400 REM DEAD FROM SKULL                 :rem 69
405 POKETL,32:POKETL+Q,32:POKECL,46:POKEC
    L+Q,47:POKECL+CM,0:POKECL+CM+Q,0
                                       :rem 66
410 GOTO700                            :rem 101
450 REM AT BOG                         :rem 234
452 D=INT(RND(1)*10)+1                 :rem 165
453 JB=NOT(-(PEEK(56320)AND16)/16)
                                       :rem 107
455 IFJBANDPEEK(CJ)=59ANDD>2THENCL=CH:POK
    ECI,32:SC=SC+100*AA:FG=P:RETURN
                                       :rem 70
460 IFJBANDPEEK(CJ)<>59ANDD>2THENCL=CL+47
    :GOTO300                           :rem 32
465 CL=CH+41:POKETL,32:POKETL+Q,32:POKECL
    ,46:POKECM+CL,3:GOTO700            :rem 224
500 REM BORDER                          :rem 55
510 PRINT"{CLR}":CM=54272               :rem 5
520 FORI=1024TO1063:POKEI,35:POKECM+I,14:
    NEXT                               :rem 245
525 FORI=1103TO2023STEP40:POKEI,35:POKECM
    +I,14:NEXT                         :rem 149
```

```
530 FORI=1982TO1943STEP-1:POKEI,35:POKECM
    +I,14:NEXT                          :rem 164
535 FORI=1984TO1064STEP-40:POKEI,35:POKEC
    M+I,14:NEXT                         :rem 216
536 RETURN                              :rem 126
539 REM SCOR+TRES CHST                  :rem 87
540 PRINT"{HOME}{24 DOWN}{RIGHT}{CYN}ROUN
    D"RN"SCORE"SC;:IFFGTHEN555          :rem 174
545 RD=INT(RND(1)*15)                   :rem 163
550 ONRDGOSUB555,555,555,555,555,555,561,
    555,555,555,555,555,563,555,555:rem 2
555 RETURN                              :rem 127
561 IFPEEK(CI)=32ANDPEEK(CJ)=32THENPOKECI
    ,58:POKECJ,59:POKECI+CM,6:POKECJ+CM,6
                                        :rem 127
562 RETURN                              :rem 125
563 IFPEEK(CI)=58THENPOKECI,32:POKECJ,32
                                        :rem 219
564 RETURN                              :rem 127
600 REMMOVESKULLS                       :rem 143
605 D=INT(RND(1)*AA)+1:ONDGOSUB641,642,64
    3,644,645                           :rem 34
608 TS=SK:Z=SK:POKESK,32                :rem 39
610 ONINT(RND(1)*8)+1GOSUB91,92,93,94,95,
    96,97,98                            :rem 180
615 SK=Z:IFPEEK(SK)=32THENONDGOSUB1381,13
    82,1383,1384,1385:GOTO625           :rem 171
620 IFPEEK(SK)=46ORPEEK(SK)=47THEN400
                                        :rem 2
622 SK=TS                               :rem 28
625 POKESK,42:POKESK+CM,7:RETURN        :rem 59
641 SK=S1:RETURN                        :rem 20
642 SK=S2:RETURN                        :rem 22
643 SK=S3:RETURN                        :rem 24
644 SK=S4:RETURN                        :rem 26
645 SK=S5:RETURN                        :rem 28
650 REMSTAGGER                          :rem 140
655 POKETL,32:POKETL+Q,32:POKECL,46:POKEC
    L+Q{SCR UP}{RVS}7:POKECL+CM,4:POKECL+
    CM+Q,4                              :rem 28
660 POKESN+1,40:POKESN+4,33:FORI=1TO10:NE
    XT:POKESN+1,45:FORI=1TO25:NEXT
                                        :rem 254
662 POKESN+4,32                         :rem 94
665 TL=CL:Z=CL:ONINT(RND(1)*8)+1GOSUB91,9
    2,93,94,95,96,97,98                 :rem 196
670 CL=Z:IFFL=.THENFL=P:GOTO300         :rem 221
680 IFFL=PTHENFL=.:GOTO300              :rem 126
700 REMDEADSOUND                        :rem 18
710 POKESN+1,40:POKESN+4,33:FORX=1TO5:POK
    ESN+1,40:FORL=1TO50:NEXT:POKESN+1,20
                                        :rem 84
715 FORL=1TO50:NEXT:NEXT:POKESN+4,32
                                        :rem 50
720 DF=1:RETURN                         :rem 171
800 PRINT"{CLR}{RVS}{4 SPACES}YOU ARE HUNTING
    {SPACE}LOST PIRATE TREASURE ON ";
                                        :rem 225
810 PRINT"A SECLUDED ISLAND.{22 SPACES}";
                                        :rem 24
820 PRINT"{BLU}GUIDE THE HUNTER WITH JOYS
    TICK #2 TO THE";                    :rem 111
830 PRINT"COINS, GOLD BARS AND A TREASURE
     CHEST.{2 SPACES}";                 :rem 193
831 PRINT"THE TREASURE CHEST IS SURROUNDE
    D BY A{3 SPACES}";                  :rem 238
832 PRINT"BOG.{2 SPACES}YOU HAVE A 70% CH
    ANCE OF CROSSING ";                 :rem 60
835 PRINT"BY PRESSING THE FIRE BUTTON AS
    {SPACE}YOU{6 SPACES}";              :rem 38
838 PRINT"{PUR}THE TREASURE HAS A DEATH C
    URSE ON IT AND";                    :rem 169
839 PRINT"IS GUARDED BY THE EVIL SPIRITS
    {SPACE}OF{7 SPACES}";               :rem 183
840 PRINT"ANCIENT PIRATES WHO MAKE THE TR
    EASURE{3 SPACES}";                  :rem 26
841 PRINT"CHEST DISAPPEAR AND REAPPEAR FR
    OM TIME{2 SPACES}";                 :rem 63
842 PRINT"TO TIME.{32 SPACES}";         :rem 170
854 PRINT"{GRN}THE EVIL SPIRITS ALSO HAVE
     PLACED KEGS{2 SPACES}";            :rem 48
855 PRINT"OF RUM AROUND THE ISLAND TO DIS
    TRACT{4 SPACES}";                   :rem 157
856 PRINT"TREASURE HUNTERS.{23 SPACES}";
                                        :rem 113
857 PRINT"{7 SPACES}IF THE TREASURE HUNTER DRI
    NKS RUM, HE{3 SPACES}";             :rem 115
858 PRINT"WILL STAGGER AND YOU CAN'T GUID
    E HIM.{3 SPACES}";                  :rem 141
860 PRINT"{RED}YOU EARN POINTS AS SHOWN:
    {15 SPACES}";                       :rem 35
865 PRINT"COIN=1 X SKILL LEVEL{20 SPACES}
    ";                                  :rem 149
866 PRINT"BAR=10 X SKILL LEVEL{20 SPACES}
    ";                                  :rem 114
867 PRINT"TREASURE CHEST=100 X SKILL LEVE
    L{8 SPACES}";                       :rem 176
880 RETURN                              :rem 128
999 REMBUILD PALMGROVE                  :rem 172
1000 TB=INT(RND(1)*8)+2:PRINT"{HOME}":I=I
     NT(RND(1)*3)+1:FORX=0TOI:PRINT"
     {DOWN}":NEXT                       :rem 149
1005 PRINTTAB(TB)"{GRN}&%'&%'"          :rem 87
1006 PRINTTAB(TB)"($&%')&%'"            :rem 175
1010 PRINTTAB(TB)"{RIGHT}$($&%'$)"
                                        :rem 157
1015 PRINTTAB(TB)"{3 RIGHT}$($)$":rem 106
1020 PRINTTAB(TB)"{3 RIGHT}$ $ $" :rem 21
1023 PRINTTAB(TB)"{5 RIGHT}${BLK}
     {2 SPACES},+"                      :rem 241
1025 PRINTTAB(TB)"{GRN}{5 RIGHT}${BLU}:;
     {SPACE}{BLK},"                     :rem 122
1027 PRINTTAB(TB)"{8 RIGHT},+"          :rem 152
1028 PRINTTAB(TB)"{5 RIGHT}+,+," :rem 153
1030 CH=PEEK(209)+256*PEEK(210)-(160-(TB+
     7)):CJ=CH+Q:CI=CJ-P                :rem 59
1035 RETURN                             :rem 169
1300 REM BUILD SCREEN                   :rem 216
1301 FORI=PTO7*AA                        :rem 8
1302 X=INT(RND(1)*720)+1064             :rem 182
1305 IFPEEK(X)<>32ORPEEK(X+P)<>32ORPEEK(X
     -P)<>32ORPEEK(X+Q)<>32THEN1302
                                        :rem 88
1306 IFPEEK(X-Q)<>32THEN1302            :rem 121
1310 POKEX,45:POKECM+X,4:NEXT            :rem 54
1320 FORI=PTO6*AA                        :rem 8
1325 X=INT(RND(1)*720)+1064             :rem 187
1330 IFPEEK(X)<>32ORPEEK(X+P)<>32ORPEEK(X
     -P)<>32ORPEEK(X+Q)<>32THEN1325
                                        :rem 91
1331 IFPEEK(X-Q)<>32THEN1325            :rem 124
1335 POKEX,42:POKECM+X,0:NEXT            :rem 54
1360 FORI=PTOAA                         :rem 172
1365 SK=INT(RND(1)*720)+1064:IFPEEK(SK)<>
     42THEN1365                         :rem 192
1370 POKESK+CM,7                        :rem 182
1375 ONIGOSUB1381,1382,1383,1384,1385
                                        :rem 241
1380 NEXT:GOTO1400                       :rem 67
1381 S1=SK:RETURN                        :rem 70
```

```
1382 S2=SK:RETURN                          :rem 72
1383 S3=SK:RETURN                          :rem 74
1384 S4=SK:RETURN                          :rem 76
1385 S5=SK:RETURN                          :rem 78
1400 GC=25:B=60:FORI=1TO25                 :rem 244
1410 GOSUB1450                             :rem 16
1415 IFPEEK(X)<>32ORPEEK(X+Q)><32ORPEEK(X
     -Q)><32THEN1410                       :rem 146
1420 POKEX,B:POKECM+X,7:NEXT               :rem 20
1430 GB=5:B=61:FORI=1TO5                   :rem 147
1435 GOSUB1450                             :rem 23
1437 IFPEEK(X)<>32ORPEEK(X+Q)><32ORPEEK(X
     -Q)><32THEN1435                       :rem 157
1440 POKEX,B:POKECM+X,7:NEXT               :rem 22
1445 RETURN                                :rem 174
1450 X=INT(RND(1)*755)+1064:RETURN
                                           :rem 220
1600 REMGAMEOVER                            :rem 1
1605 POKESN+4,32:POKE53272,21              :rem 135
1610 PRINT"{CLR}{3 DOWN}{RVS}{YEL}ANOTHER
      VICTIM OF THE PIRATE'S CURSE!!!"
                                           :rem 134
1611 PRINT"{DOWN}{RVS}{RED}SKILL LEVEL:"A
     A                                     :rem 140
1612 PRINT"{DOWN}{RVS}{RED}ROUNDS:"RN
                                           :rem 143
1613 PRINT:PRINT"{RVS}{RED}SCORE:"SC
                                           :rem 221
1615 PRINT:PRINT"{RVS}{RED}PLAY AGAIN?"
                                           :rem 104
1620 GETA$:IFA$=""THEN1620                 :rem 181
1625 IFA$="Y"THENRN=0:FL=0:FG=0:DF=0:SC=0
     :PRINT"{CLR}":GOTO49                   :rem 49
1630 END                                   :rem 161
6060 DATA255,255,255,255,255,255,255,255,
     28,28,28,28,28,28,28,28               :rem 170
6065 DATA129,227,247,255,255,255,255,156,
     15,127,127,227,143,63,113,243
                                           :rem 195
6070 DATA248,254,254,227,249,252,207,227,
     199,159,62,56,120,96,96,64,121,120,2
     8                                      :rem 91
6071 DATA14,6,6,7,                         :rem 160
6075 DATA60,126,90,126,126,36,60,24,28,63
     ,31,255,255,127,124,56                :rem 90
6080 DATA60,254,255,255,243,120,56,60,28,
     62,62,62,62,62,62,28                  :rem 246
6085 DATA60,126,219,255,102,60,24,255,189
     ,189,189,189,36,36,36,102              :rem 9
6087 DATA15,31,63,63,63,63,63,63,248,252,
     254,254,254,254,254,254               :rem 156
6090 DATA,,,24,24,,,,,,,127,127,,,0
                                           :rem 173
```

MLX

(Article on page 145.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
10 REM LINES CHANGED FROM MLX VERSION 2.0
   0 ARE 750,765,770 AND 860               :rem 50
100 PRINT"{CLR}{6}";CHR$(142);CHR$(8);:
    POKE53281,1:POKE53280,1                :rem 67
101 POKE 788,52:REM DISABLE RUN/STOP
                                           :rem 119
110 PRINT"{RVS}{39 SPACES}";               :rem 176
120 PRINT"{RVS}{14 SPACES}{RIGHT}{OFF}
    {*}£{RVS}{RIGHT} {RIGHT}{2 SPACES}
    {*}{OFF}{*}£{RVS}£{RVS}
    {14 SPACES}";                          :rem 250
130 PRINT"{RVS}{14 SPACES}{RIGHT} {G}
    {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
    {OFF}{*}{RVS}{14 SPACES}";             :rem 35
140 PRINT"{RVS}{41 SPACES}"                :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK} MACHINE LANG
    UAGE EDITOR VERSION 2.01{5 DOWN}"
                                           :rem 237
210 PRINT"{5}{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}";                   :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F)
                                           :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210                  :rem 235
225 PRINT:PRINT:PRINT                      :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F)                         :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230                  :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                           :rem 176
260 PRINT:PRINT:PRINT                      :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S:POKEV+21,0
                                           :rem 225
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":";                             :rem 33
315 FORJ=ATO6                              :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                           :rem 228
390 IFN=-211THEN 710                       :rem 62
400 IFN=-204THEN 790                       :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                         :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                           :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                           :rem 238
420 IF N<>-196 THEN 480                    :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                              :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                                      :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";             :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";              :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                           :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                              :rem 50
480 IFN<0 THEN PRINT:GOTO310               :rem 168
490 A(J)=N:NEXTJ                           :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT            :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                                     :rem 94
511 IFN=-1THENA=6:GOTO315                  :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                           :rem 122
```

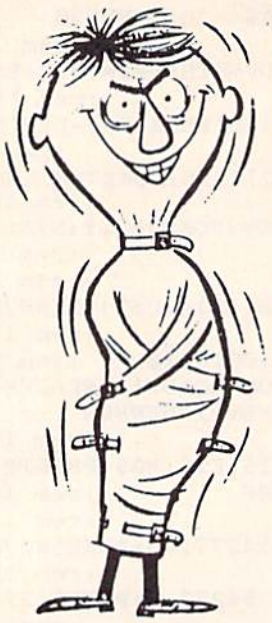
```
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                          :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0                  :rem 227
550 AD=AD+6:IF AD<E THEN 310           :rem 212
560 GOTO 710                           :rem 108
570 N=0:Z=0                             :rem 88
580 PRINT"{£}";                         :rem 81
581 GETA$:IFA$=""THEN581               :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"               :rem 134
584 IFAV>0THENA$=CHR$(48+AV)           :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                      :rem 229
590 IFA>128THENN=-A:RETURN             :rem 137
600 IFA<>20 THEN 630                    :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}{LEFT} {LEFT}";:GOTO690       :rem 62
620 GOTO570                            :rem 109
630 IFA<48ORA>57THEN580                :rem 105
640 PRINTA$;:N=N*10+A-48               :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                       :rem 229
660 Z=Z+1:IFZ<3THEN580                  :rem 71
670 IFZ=0THENGOSUB1000:GOTO570         :rem 114
680 PRINT",";:RETURN                   :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                       :rem 149
691 FORI=1TO3:T=PEEK(S%-I)              :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                       :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                         :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                       :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL SAVE){DOWN}":rem 106
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THENPRINT:PRINT:GOTO310          :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"            :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                       :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15         :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                    :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                       :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                 :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253                    :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496                    :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                       :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO310
                                       :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720           :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720               :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                       :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL LOAD)"            :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO310              :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"            :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                       :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                      :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                    :rem 2
841 POKE781.ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                       :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                 :rem 70
850 POKE780,0:SYS65493                 :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                       :rem 111
865 PRINT"{DOWN}DONE.":GOTO310         :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                       :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800               :rem 102
1000 REM BUZZER                        :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
     165                               :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
     5                                  :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
     273,0:POKE54272,0:RETURN          :rem 202
2000 REM BELL SOUND                     :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
     47                                :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
     ,0                                 :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                       :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                          :rem 89
```

Animating The VIC

(Article on page 135.)

Pop Up

```
1 PRINT"{CLR}":POKE36879,11:X=7912:R=0:Y=
  0:SC=0                               :rem 117
10 POKE37154,127:P=PEEK(37152)AND128:J0=-
   (P=0)                               :rem 51
20 P=PEEK(37151):J1=-((PAND8)=0):J2=-((PA
   ND16)=0)                            :rem 168
40 J3=-((PAND4)=0):R=(J0-J2)+22*(J1-J3):I
   FX+R<7680ORX+R>8185THEN57           :rem 241
50 IFPEEK(X+R)<81ANDPEEK(X+R)<>32THEN300
                                       :rem 163
55 POKEX,32:X=X+R:POKEX+30720,1:POKEX,94:
   IFR<>0THENSC=SC+1                   :rem 126
57 POKE36878,15:POKE36876,INT(RND(1)*127+
   128)                                :rem 12
60 POKE36878,100-SQR(100):IFRND(1)*11>4TH
   EN10                                :rem 36
70 Y=INT(RND(1)*512+1):POKE38400+Y,INT(RN
   D(1)*9+8):POKE7680+Y,42+RND(1)*2:GOTO1
   0                                   :rem 82
300 POKE36876,0:POKE36874,0:POKE36875,0
                                       :rem 207
302 POKE36878,15:FORI=200TO140STEP-1:POKE
    36874,I:POKE36875,I:FORE=1TO20:NEXT
                                       :rem 152
303 POKEX+30720,INT(I/14):NEXT:POKE36878,
    0:POKE36874,0:POKE36875,0          :rem 122
304 PRINT"{CLR}{WHT}{10 DOWN}{3 SPACES}FI
    NAL SCORE:"SC                      :rem 96
```



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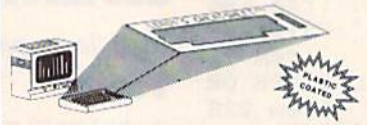

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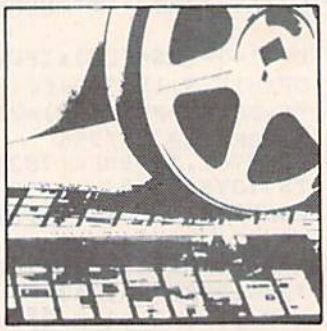

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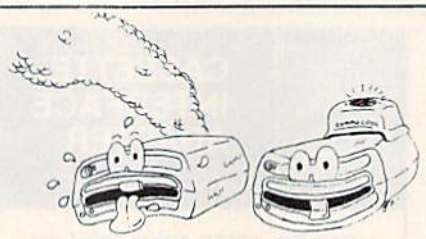

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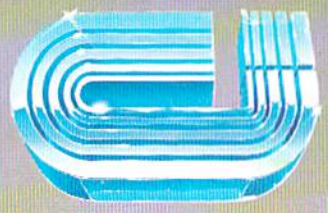

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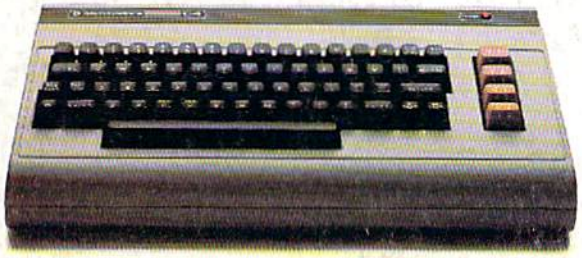

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